MP1570A
SONET/SDH/PDH/ATM Analyzer
Operation Manual
Vol.4
2.5G/10G Measurement

First Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measuring Instruments Division
Measurement Group
ANRITSU CORPORATION

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2000

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Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
Some or all of the following symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.

Safety Symbols Used on Equipment and/or in Manual

DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING This indicates a potential dangerous procedure that could result in serious injury or death if not performed properly.

CAUTION This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

Safety Symbols Used on Equipment and/or in Manual

The following safety symbols are used inside or on the equipment near operation locations, and/or in manual to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.

These indicate that the marked part should be recycled.

MP1570A
SONET/SDH/PDH/ATM Analyzer
Operation Manual Vol.4 2.5G/10G Measurement

7 February, 2000 (First Edition)

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ERRATA

MP1570A Operation Manual

The following revisions were made after the first edition of the MP1570A Operation Manual was issued. Please read the column on the right for the changes to the items in the column on the left.

<table>
<tr><th>Page</th><th>For</th><th>Read</th></tr>
<tr><td>vi</td><td>__T indicates a time-lug fuse.</td><td>__F indicates a normal fusing type fuse.</td></tr>
<tr><td>vii</td><td>Also, the MP0111A,MP0112A,MP0113A, MP0127A....,and MU150010A use PD/LD modules and IC including arsenic.</td><td>Also, the MP0111A,MP0112A,MP0113A, MP0122B,MP0127A....,and MU150010A use PD/LD modules and IC including arsenic.</td></tr>
<tr><td>vii</td><td>The input level of the optical signal to the MP0111A,MP0112A,MP0113A,MP0127A, MP0128A,MP0129A,MU150001A/B,MU150008A.....must not exceed....</td><td>The input level of the optical signal to the MP0111A,MP0112A,MP0113A,MP0122B,MP0127A,MP0128A,MP0129A,MU150002A,MU150008A.....must not exceed....</td></tr>
<tr><td>viii</td><td>The MP0111A,MP0112A,MP0113A,MP0127A,MP0128A,....MU150010A use laser light.</td><td>The MP0111A,MP0112A,MP0113A,MP0122B,MP0127A,MP0128A,....MU150010A use laser light.</td></tr>
<tr><td>viii</td><td>The MP0111A,MP0112A and MP0113A are intrinsically safe and.....</td><td>The MP0111A,MP0112A,MP0113A and MP0122B are intrinsically safe and.....</td></tr>
<tr><td>viii</td><td>Model / Specification / Class
MP0111A,MP0112A, MP0113A — IEC825-1 — Class1
MP0111A,MP0112A, MP0113A — 21CFR1040.10 — Class I</td><td>Model / Specification / Class
MP0111A,MP0112A, MP0113A,MP0122B — IEC825-1 — Class1
MP0111A,MP0112A, MP0113A,MP0122B — 21CFR1040.10 — Class I</td></tr>
<tr><td>viii</td><td>The label shown below is attached to front panel of the MP0111A,MP0112A and MP0113A to indicate conformance.....</td><td>The label shown below is attached to front panel of the MP0111A,MP0112A,MP0113A and MP0122B to indicate conformance.....</td></tr>
</table>

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1-5	Configuration of 2.5G,10G Optical and 2.5G/10G Units	(Add the Plug-in unit accessories)

Model	Name	Qty	Remarks
W1273AE	MP1570A operation manual Vol.4 2.5G/10G measurement	1	MP0127A,MP0128A,MP0129A MU150000A,MU150001A/B, MU150002A,MU150008A,MU150009A,MU150010A
J0002C	U link cable	1set	MU150000A
J0907Q	Remote inter lock code	1	MP0127A,MP0128A,MP0129A,MU150001A/B,MU150008A,MU150009A,MU150010A
J0908	Remote inter lock terminator	1	MP0127A,MP0128A,MP0129A,MU150001A/B,MU150008A,MU150009A,MU150010A
J1002A	U link	1set	MU150001A/B
J1003K	U link	1set	MP0127A,MP0128A,MP0129A,MU150008A,MU150009A, MU150010A
E0008A	Optical output control key	2	MP0127A,MP0128A,MP0129A,MU150001A/B,MU150008A,MU150009A,MU150010A
J1002B	U link	1set	MU150002A
J0747B	Optical attenuator(10dB)	1	MU150002A
J0747C	Optical attenuator(15dB)	1	MP0127A,MP0128A,MP0129A,MU150008A,MU150009A, MU150010A

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A-1	Item No.2.6 Optical input return loss ">=27dBm(1310nm)"	Item No.2.6 Optical input return loss "27dBm(1310nm) or more"
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A-14	Item No.10.6 Error Measurement "B1, B2, Bit (for Non-frame Pattern) Measurement range Error Count : 0-999999, 1.0E06-9.9E15, >9.9E15 Error Ratio : 1.0E-15-9.9E-01, 1.0E-00, <1.0E-15"	Item No.10.6 Error Measurement "Refer to Vol.1."
A-14	Item No.10.7 Alarm Measurement "LOS, LOF, OOF, MS-AIS, MS-RDI SyncLoss (for Non-frame Pattern) Alarm second : 0-999999, 1.0E06-9.9E15, >9.9E15"	Item No.10.7 Alarm Measurement "Refer to Vol.1."

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	LOF, MS-AIS/AIS-L, ···	Refer to Vol.1.
	··· and MS-RDI/RDI-L only.	
A-66	Item 2.1.9.1 Insert signal	
	STM0/STS1 and STM1/STS3	STM1/STS3
A-67	Item 2.1.10 OH change	
	SOH/TOH : ···	Refer to Vol.1.
	··· B=1 to 8000 times	
A-67	Item 2.1.11 OH BERT	
	SOH/TOH : ···	Refer to Vol.1.
	··· 2^{15}-1	
A-67	Item 2.1.10 OH add	
	SOH/TOH : ···	Refer to Vol.1.
	··· ON, OFF	
A-68	Item 2.2.1.2 With frame	
	Same as the main frame	Refer to Vol.1.
A-68	Item 2.2.2 Mapping	
	See "1.6 Mapping Route Measurable When Installing the 2.5G/10G and 10G Unit".	See "1.5 Mapping Route Measurable When Installing the 2.5G Unit" and "1.6 Mapping Route Measurable When Installing the 2.5G/10G Unit".
	SDH/SONET	~~SDH/SONET~~
	* : SDH and SONET have a same mapping despite the name difference.	~~* : SDH and SONET have a same mapping despite the name difference.~~

Page	For	Read
A-69	Item 2.2.3 Test pattern	
	PRBS : ···	Refer to Vol.1.
	··· and non-frame.	
A-69	Item 2.2.4.1 Error measurement	
	Same as the main frame	Refer to Vol.1.
A-69	Item 2.2.4.2 Performance	
	Same as the main frame	Refer to Vol.1.
A-69	Item 2.2.4.3 Alarm measurement	
	Same as the main frame	Refer to Vol.1.
A-70	Item 2.2.4.4 Detection/release condition	
	Same as the main frame	Refer to Vol.1.
A-70	Item 2.2.6 OH monitor	
	Same as the main frame	Refer to Vol.1.
A-70	Item 2.2.7 OH Capture	
	Same as the main frame	Refer to Vol.1.
A-70	Item 2.2.8 OH BERT	
	Same as the main frame	Refer to Vol.1.
A-70	Item 2.2.9 OH Drop	
	Same as the main frame	Refer to Vol.1.
A-70	Item Error/Alarm addition	
	For Error/Alarm addition see Item 2.1	~~For Error/Alarm addition see Item 2.1~~
	For Error addition, see Item 2.1.7.	~~For Error addition, see Item 2.1.7.~~
	For Alarm addition, see Item 2.1.8.	~~For Alarm addition, see Item 2.1.8.~~

For Safety

CAUTION ⚠

The input level of the optical signal is 0dBm (-8dBm : MU150002A option 01). Excessive input level can damage the internal devices and circuit.

Before performing a self loop-back test, always install 15dB attenuator between the output connector and the input connector.

For Safety

WARNING ⚠

ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

Laser Radiation Warning

- NEVER look directly into the cable connector on the equipment nor into the end of a cable connected to the equipment. If laser radiation enters the eye, there is a risk of injury.
- Laser Radiation Markings on a following page show the Laser Safety label attached to the equipment near the cable connector.

When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

This equipment should be installed by following a specified installation method. If this is not followed, it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

WARNING ⚠

Battery Fluid

DO NOT short the battery terminals and never attempt to disassemble it or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak.

This fluid is poisonous.

DO NOT touch it, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

LCD

This instrument uses a Liquid Crystal Display (LCD); DO NOT subject the instrument to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
This liquid is very caustic and poisonous.
DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, irrigate them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

WARNING ⚠

Changing Fuses

Before changing the fuses, ALWAYS remove the power cord from the power outlet. There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

ALWAYS use new fuses of the type and rating specified on the fuse marking on the side panel of the MP1570A.

___T indicates a time-lag fuse.

Cleaning

Keep the power supply and cooling fan free of dust.
Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the MP1570A may overheat and catch fire.

Floppy Disk

Clean regularly floppy disk drive since it may malfunction due to dust. Use a cleaning kit sold at market for cleaning.
Anritsu does not recommend any specific cleaning kit. Contact with Anritsu or our sales representative if you inquire about the cleaning kit.
If the floppy disk drive malfunctions even after the cleaning, it is considered to be a fault. Ask for repair to Anritsu or our sales representative.

For Safety

WARNING ⚠

Replacement of the battery used for back up of the memory

The MP1570A uses a Poly-carbomonofluoride Lithium Battery for back up of the memory. Replacement is performed by Anritsu Service Division. Contact with an Anritsu business office or sales representative which is located close to you.

Note: The life of a battery for the MP1570A is about seven years. It should be replaced before the expiration of its life.

The MP1570A employs a Poly-carbomonofluoride Lithium Battery. Also, the MP0111A, MP0112A, MP0113A, MP0127A, MP0128A, MP0129A, MU150001A/B, MU150002A, MU150008A, MU150009A, and MU150010A use PD/LD modules and IC including arsenic. Should the MP1570A be discarded for any reason, dispose it according to the waste disposal laws of your own country.

Before making the connections, make sure that the output level from the MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, and MU150010A does not exceed the absolute maximum rating level of the equipment to be measured.

The input level of the optical signal to the MP0111A, MP0112A, MP0113A, MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, and MU150010A must not exceed the absolute maximum rating (0 dBm at peak power).

Excessive input level can damage the internal devices and circuit.

The laser output is mainly controlled by the key switch of the laser On/Off. Before turning the equipment on, be sure to set the Laser On/Off key switch to OFF.

Before performing a self loop-back test, always install 15dB attenuator between the output connector and the input connector. If they are directly connected with an optical fiber, the internal devices and circuit can be damaged.

For Safety

The MP0111A, MP0112A, MP0113A, MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, and MU150010A use laser light.

The MP0111A, MP0112A, and MP0113A are intrinsically safe and meet the class 1 of the standards below.

The MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, and MU150010A meet the Class3A or Class III b

These laser light sources meet following standards.

Model	Specification	Class
MP0111A,MP0112A, MP0113A	IEC825-1	Class 1
	21CFR1040.10	Class I
MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, MU150010A	IEC825-1	Class3A
	21CFR1040.10	Class III b

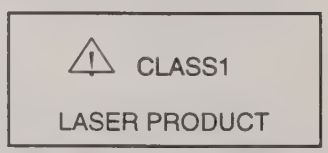
The danger classification specified by JIS, IEC825-1, and 21CFR1040.10 is explained below.

Class 1: Safe laser presenting no danger when used according to design specifications.

Class 3A: Laser radiating in 400 to 700 nm wavelength range. The danger to the eyes is eliminated by the eye avoidance reaction including the blink response. For lasers radiating at other wavelengths, the degree of danger to the naked eyed is not greater then Class 1.

Class III b: The eyes will be damaged if direct laser radiation enters the eyes. Normally there is no danger if the diffused beam is observed.

The label shown below is attached to front panel of the MP0111A, MP0112A, and MP0113A to indicate conformance to these standards.



MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A, and MU150001A/B

See table 1 and Fig. 1 to 6

Table 1

No.	Label	Description
[1]	AVOID EXPOSURE INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE	Aperture label (FDA21CFR1040.10)
[2]	DANGER INVISIBLE LASER RADIATION AVOID DIRECT EXPOSURE TO BEAM MAXIMUM POWER 10 mW WAVELENGTH 1.31/1.55 μm CLASS Ⅲb LASER PRODUCT	Explanatory label (FDA21CFR1040.10)
[3]	INVISIBLE LASER RADIATION DO NOT INTO STARE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (MAX) (PULSE DURATION) (WAVELENGTH) 10mW CW 1.31/1.55 μm CLASS 3A LASER PRODUCT	Explanatory label (IEC 825-1)
[4]	不可視レーザ光 ビームをのぞき込まないこと 光学機器で直接ビームを見ないこと (最大出力) (パルス幅) (波長) 10 mW CW 1.31/1.55 μm クラス3Aレーザ製品	Explanatory label (IEC 825-1)
[5]		Warning label (IEC 825-1)
[6]	CERTIFICATION LABEL THIS PRODUCT CONFORMS TO ALL APPLICABLE STANDARDS UNDER 21 CFR 1040.10	Certification label (FDA21CFR1040.10)
[7]	IDENTIFICATION LABEL ANRITSU CORP. 10-27, MINAMIAZABU 5-CHOME MINATO-KU, TOKYO 106, JAPAN MANUFACTURED AT: ANRITSU CORP. ATSUGI PLANT .19	Identification label (FDA21CFR1040.10)

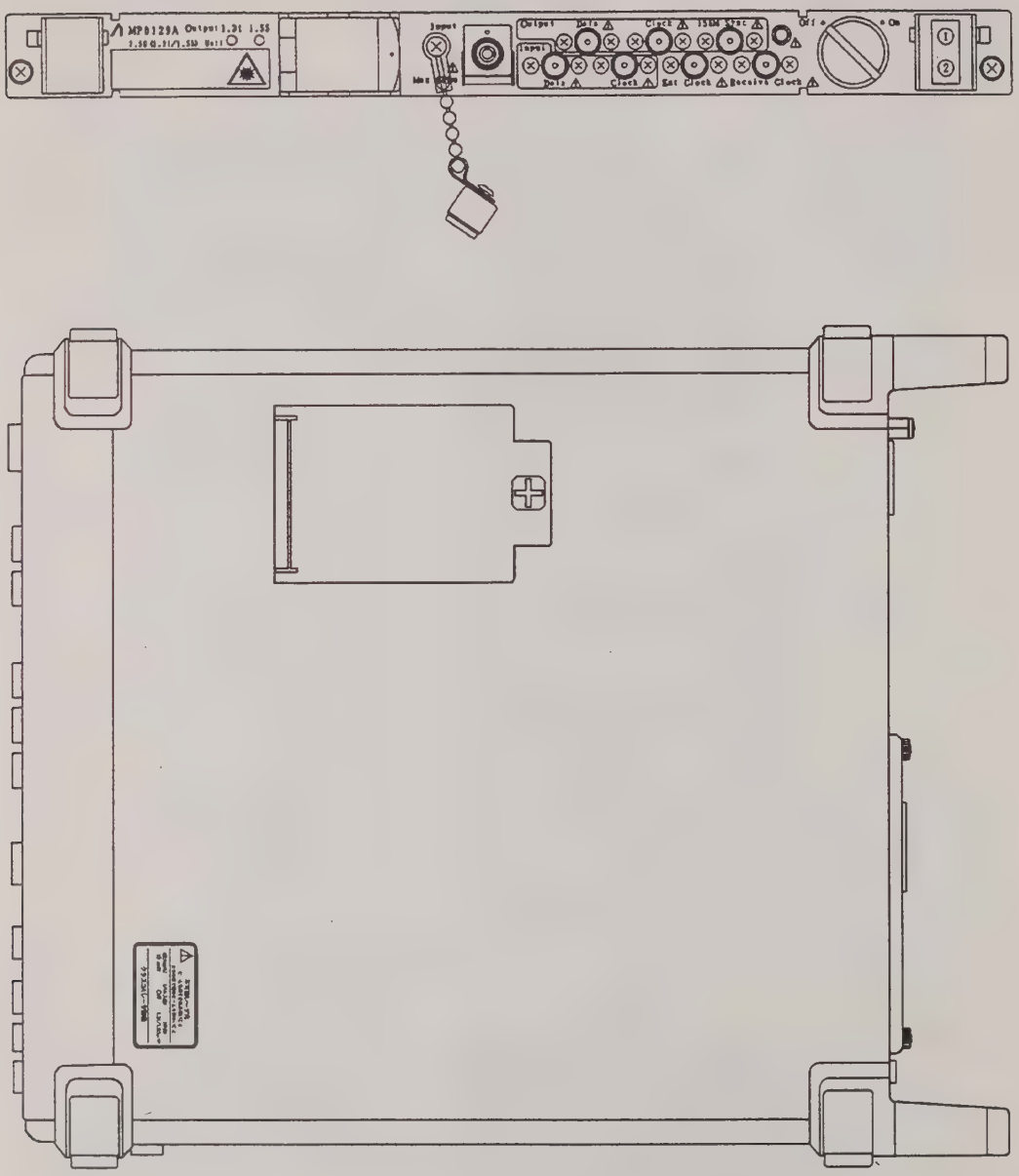


Fig. 1 MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A
Front and Side Panels (Japanese products of which shipping country is Japan)

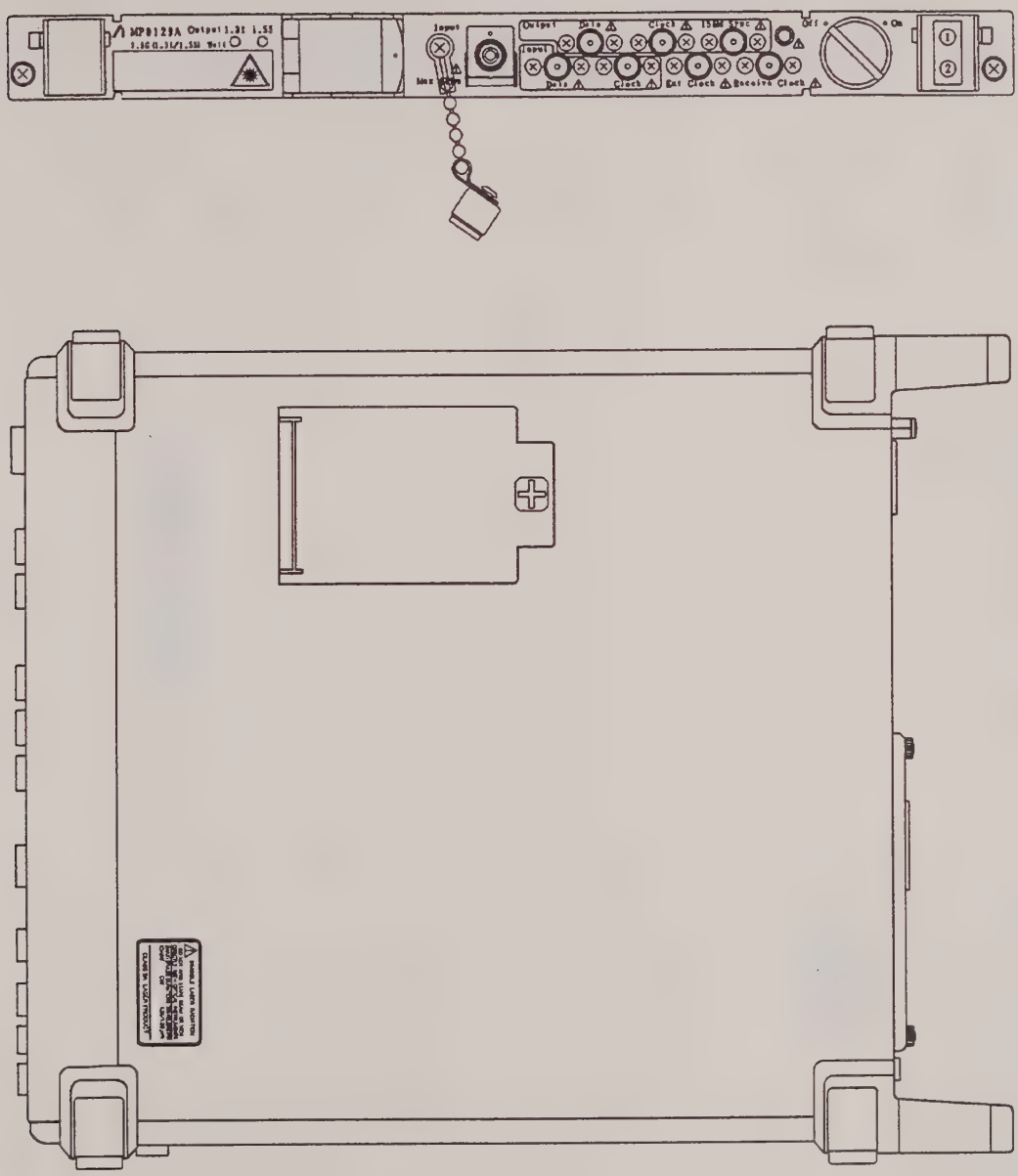


Fig. 2 MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A
Front and Side Panels (Overseas products of which shipping country is not U.S.A.)

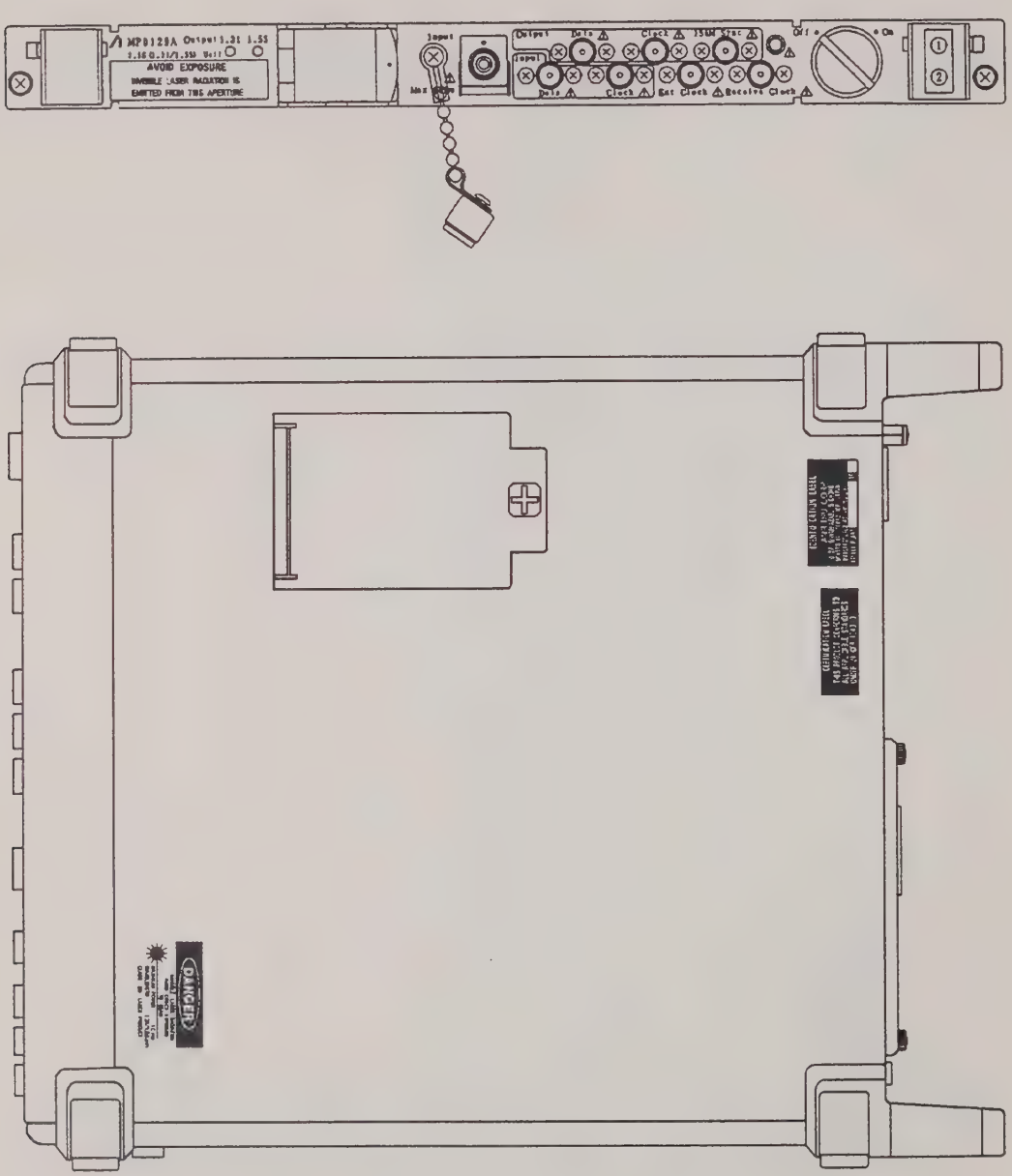


Fig.3 MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A
Front and Side Panels (Products of which shipping country is the U.S.A.)

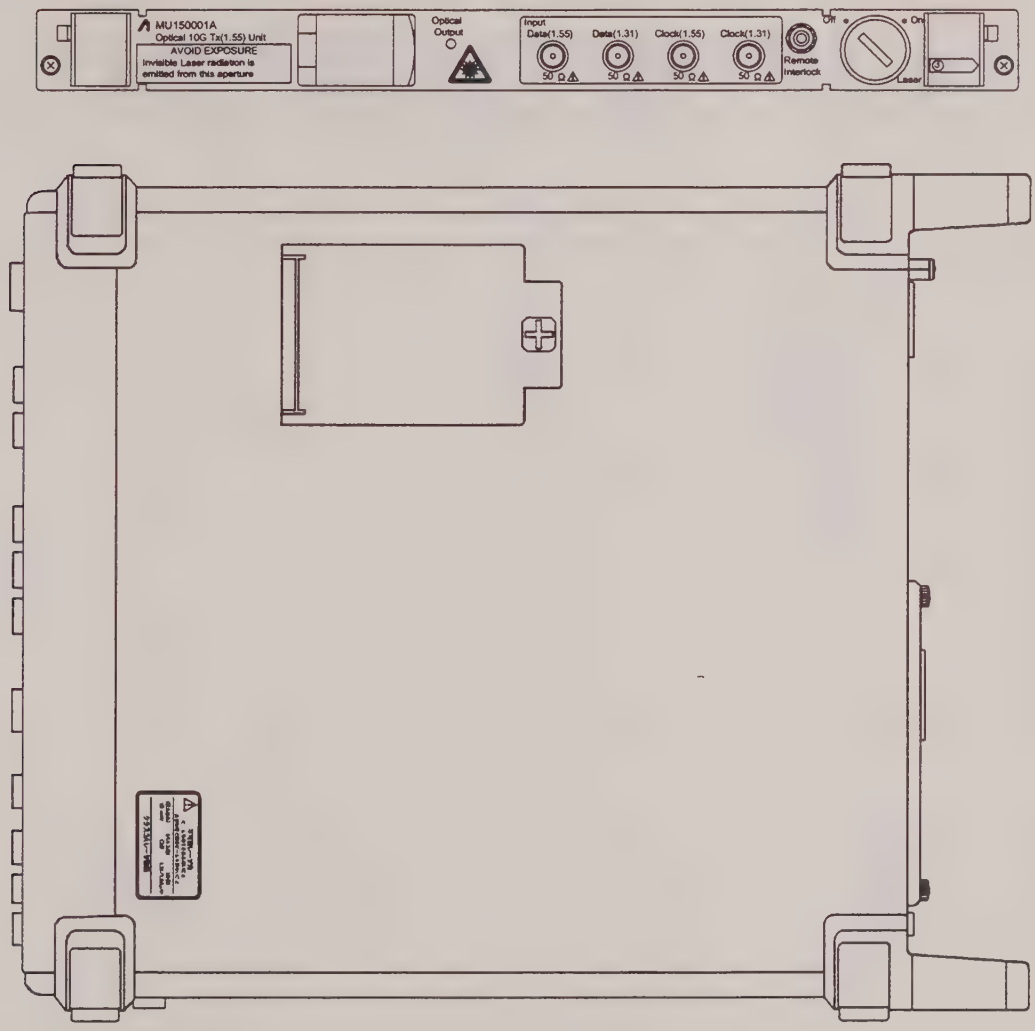


Fig. 4 MU150001A/B
Front and Side Panels (Japanese products of which shipping country is Japan)

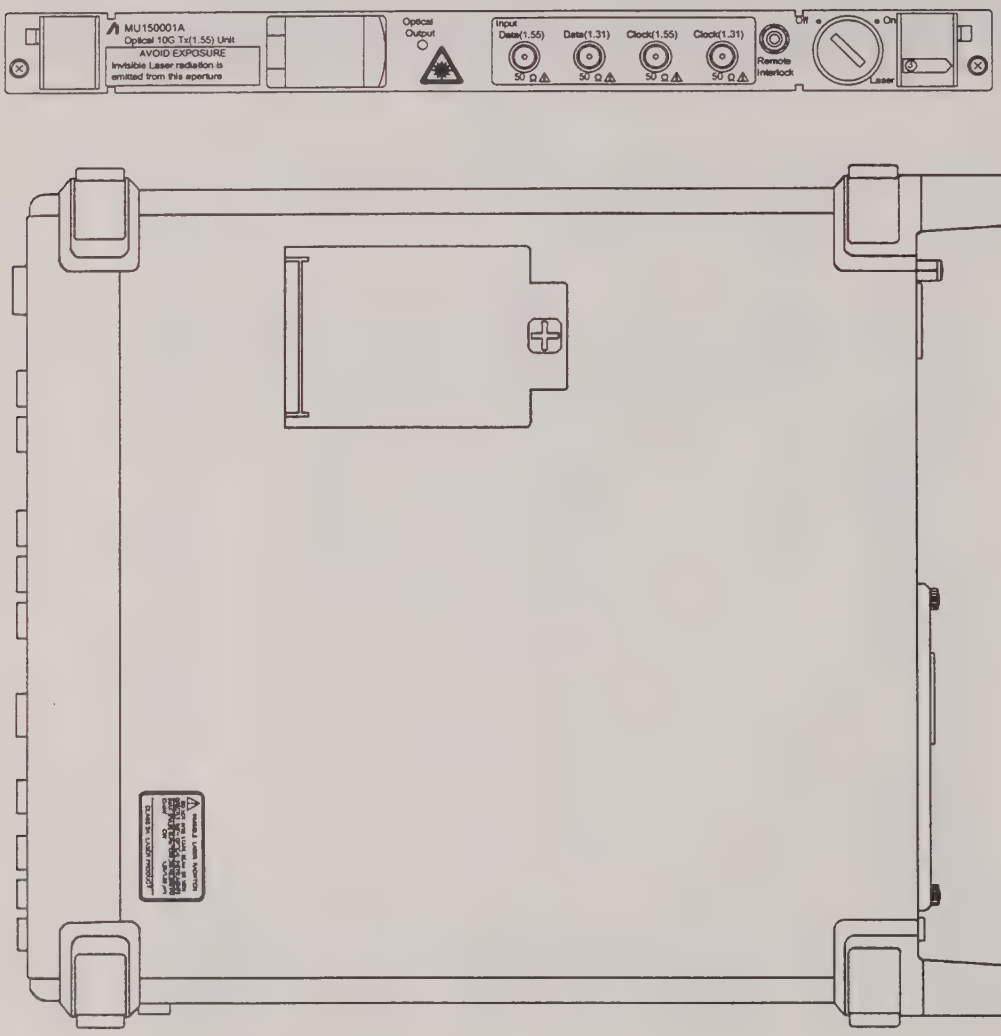


Fig. 5 MU150001A/B

Front and Side Panels (Overseas products of which shipping country is not U.S.A.)

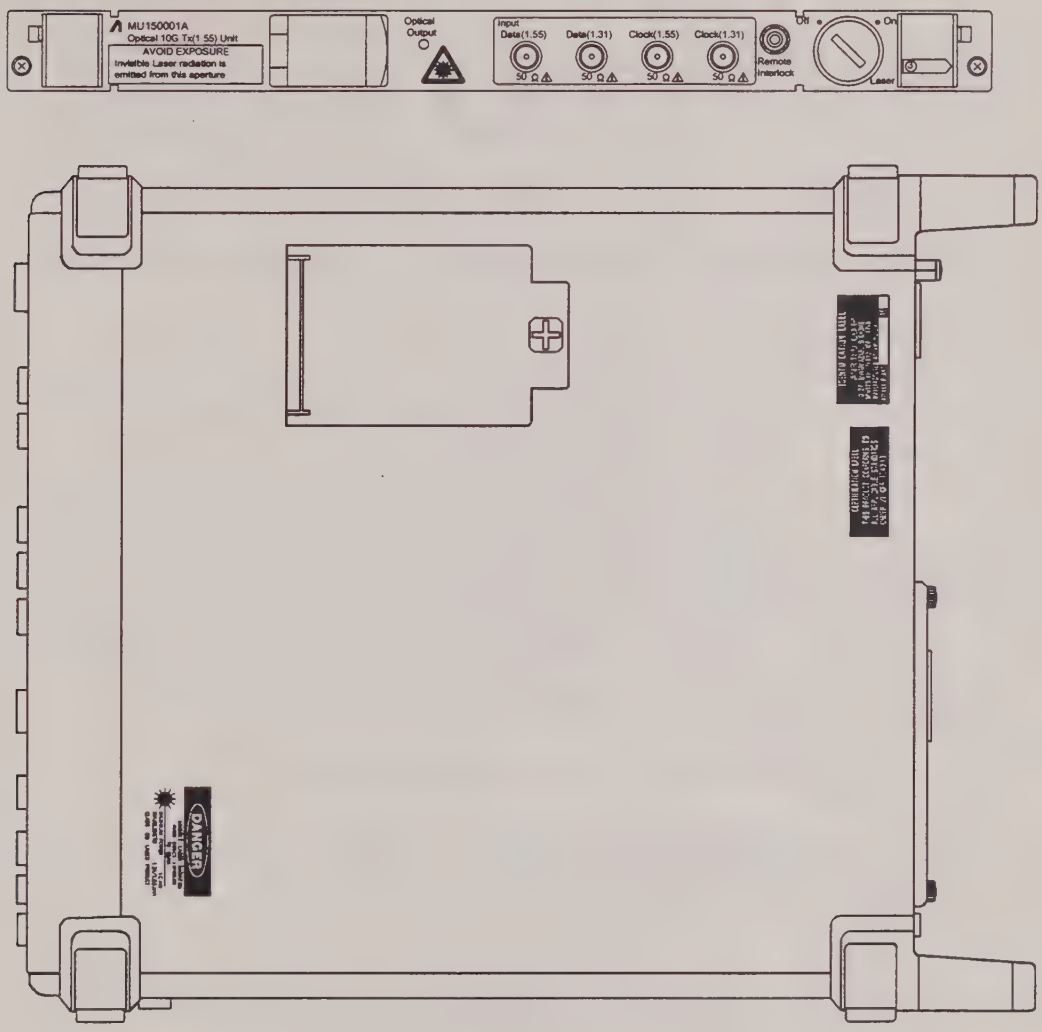


Fig.6 MU150001A/B

Front and Side Panels (Products of which shipping country is the U.S.A.)

For Safety

Security Measure Functions

The MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, MU150010A are provided with the following security measure functions to prevent the possibility of infliction bodily injury on operators.

- Laser cut-off

When the cable is disconnected from the optical output section, the protective cover closes and the laser emission stops.

- Laser output key lock

The laser output is mainly controlled by the key switch of the laser On/Off. When the switch is set to the OFF position, the key can be removed. In this state, the laser is locked off.

- Remote control using the remote interlock connectors

To ensure safe control of the laser output from a remote location, the laser output can be controlled using the remote interlock connectors of the Laser Output Remote Interlock section. When both the ends of these two connectors (white and black) are connected electrically, the laser can be emitted. When both the ends are disconnected, it is not possible to emit the laser. For the voltage of the open end, the potential is +5V at the white connector for the black connector. The laser output can be controlled by any equipment with a 0/+5V interface.

- Laser emission indicators

These indicators on the optical output light while laser is being emitted.

- Laser output warning

When the laser is set to ON, the laser emission indicator lights as a warning or 3 to 4 seconds before laser is actually emitted. The laser is not emitted during this period.

Handling

The following safety precautions should be observed when handling the MP0127A, MP0128A, MP0129A, MU150001A/B, MU150008A, MU150009A, MU150010A.

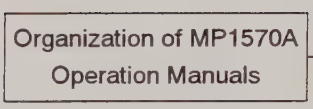
- Before installing/removing this unit in/from the main frame, always make sure the main frame power switch is set to OFF.
- Before connecting/disconnecting a cable to/from the optical output section of this unit, always be sure to set the Laser On/Off key switch to OFF.

Warning ⚠

- When the laser is set to ON and the laser emission indicator does not light, it is considered to be a fault. Ask for repair to Anritsu or our sales representative.
- Do not look directly into the end of any cable connected to the optical output connector of the unit. Laser light can seriously damage the eyes. Operating this unit in a procedure other than that as described above might result in injury or damage from laser emission Please follow the handling instructions carefully

About MP1570A Operation Manuals

MP1570A SDH/PDH/ATM Analyzer Operation Manuals comprise of the following eight documents. Use them properly according to the usage purpose.



Vol. 1

Basic Operation SDH Edition

Describes the basic operation of MP1570A, PDH measurement and SDH measurements up to 622M (STM 4). (The contents of this manual are basically the same as those of 'Basic Operation SONET Edition').

Basic Operation SONET Edition

Describes the basic operation of MP1570A, DSn measurement and SONET measurement of up to 622M (STS12). (The contents of this manual are basically the same as those of 'Basic Operation SDH Edition'.).

Vol. 2 — **Remote Control**

Describes the remote control and program examples using the GPIB and RS-232C interfaces. (MP1570A is compatible with SPCI).

Vol. 3 — **ATM Measurment**

Describes the contents of screens, operation procedures and remote control for the generation and analysis of the ATM signal.

Vol. 4 — **2.5G/10G Measurement (this manual)**

Describes the contents of screens, operation procedures and remote control for the generation and analysis of 2.5G (STM16) and 10G (STM64) signals.

Vol. 5 — **Add/Drop Measurement**

Describes the contents of screens, operation procedures and remote control for the generation and analysis of Add/Drop.

Vol. 6 — **Jitter/Wander Measurement**

Describes the contents of screens, operation procedures and remote control for the generation and analysis of Jitter (TX)/Frequency offset and Jitter (RX).

Vol. 7 — **2.5G Jitter/Wander Measurement**

Describes the contents of screens, operation procedures and remote control for the generation and analysis of 2.5G Jitter (TX)/Frequency offset and Jitter (RX).

Screen Names

MP1570A has 4 major screens, namely, 'Setup', 'Test menu', 'Result', and 'Analyze', and each major screen has its own subscreens. (For details, see MP1570A Operation Manual Vol.1 'Section 4 Screens and Parameter Setting').

If 'Setup' is selected as the main screen and 'Mapping' as the subscreen, see 'Setup: Mapping' screen in the manual for the explanation.

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Section 1 General

This section describes the 2.5G and 10G measurements and the outline of the 2.5G, 2.5G/10G, and 10G units to install to the MP1570A SONET/SDH/PDH/ATM analyzer.

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1.1 Product Outline

The MP1570A SONET/SDH/PDH/ATM analyzer can evaluate the 2.5G and 10G signals after being equipped with the 2.5G, 10G optical, and 2.5G/10G units.

1.2 Product Features

Measuring the 2.5G signal

The 2.5G signal can be measured by installing MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, or MU150010A to MP1570A.

Measuring the 10G signal (electric)

The 10G signal (electric) can be measured by installing MU150000A to MP1570A.

Measuring the 10G signal (optical)

The 10G signal (optical) can be transmitted by installing MU150000A and MU150001A/B to MP1570A. In addition, the 10G signal (optical) can be received and measured by installing MU150000A and MU150002A to MP1570A.

Mapping

Mappings can be selected by combining the MP0121A 2/8/34/139/156M (CMI) or MP0122A/B 1.5/45/52/52M units and the above mentioned 2.5G, 10G, and 2.5G/10G units.

Functions of Insert/Extract

MU150000A, MU150008A, MU150009A, and MU150010A have the function of Insert/Extract.

1.3 Configuration of 2.5G, 10G Optical, and 2.5G/10G Units

Configurations of 2.5G, 10G Optical, and 2.5G/10G units are shown in the following tables:

2.5G Unit

Model/Code	Product	remarks
MP0127A	2.5G(1.31) Unit	optical 1.31 μ m
MU150008A	2.5G(1.31) Unit	optical 1.31 μ m Insert/Extract
MP0128A	2.5G(1.55) Unit	optical 1.55 μ m
MU150009A	2.5G(1.55) Unit	optical 1.55 μ m Insert/Extract
MP0129A	2.5G(1.31/1.55) Unit	optical 1.31/1.55 μ m
MU150010A	2.5G(1.31/1.55) Unit	optical 1.31/1.55 μ m Insert/Extract

2.5G/10G Unit

Model/Code	Product	remarks
MU150000A	2.5G/10G Unit	electric Insert/Extract

- MU150000A transmits and receives electric signals of 2.5G and 10G.

10G Optical Unit

Model/Code	Product	remarks
MU150001A/B	Optical 10G Tx (1.55) Unit	Install it with the optical 1.55 μ m MU150000A at the same time.
MU150002A	Optical 10G Rx (Narrow) Unit	Install it with the optical interface MU150000A at the same time.

- Optical 10G signal can be transmitted when installing MU150000A and MU150001A/B (MU150001A/B E/O-converts the 10G electric signal generated by MU150000A and outputs it as the optical signal).
- Optical 10G signal can be received when installing MU150000A and MU150002A.

1.4 Plug-in Units Insertion Slots

Slots to insert each plug-in unit are shown in the table below.

2.5G, 2.5G/10G, and 10G units are shaded.

Plug-in units insertion slots

Unit	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
MP0121A 2/8/34/139/156M Unit	○ *1	–	–	–	–
MP0122A 1.5/45/52M Unit	○ *1	○ *1	–	–	–
MP0122B 1.5/45/52/52M(1.31) Unit	○	○	–	–	–
MP0123A ATM Unit	–	–	○	–	–
MP0124A 2/8/34/139M 156/622M Jitter Unit	–	–	–	○ *2	
MP0125A 1.5/45/52M 156/622M Jitter Unit	–	–	–	○ *2	
MP0126A 2/8/34/139M 1.5/45/52M 156/622M Jitter Unit	–	–	–	○ *2	
MP0127A 2.5G(1.31) Unit *3	○	○	–	–	–
MP0128A 2.5G(1.55) Unit *3	○	○	–	–	–
MP0129A 2.5G(1.31/1.55) Unit *3	○	○	–	–	–
MP0130A 2.5G Jitter Unit	–	–	○	–	–
MP0131A Add/Drop Unit	○	○	–	–	–
MU150000A 2.5G/10G Unit *3	–	–	–	○ *2	
MU150001A Optical 10G Tx(1.55) Unit	–	–	○	–	–
MU150002A Optical 10G Rx(Narrow) Unit	–	○	–	–	–
MU150008A 2.5G(1.31) Unit *3	–	○	–	–	–
MU150009A 2.5G(1.55) Unit *3	–	○	–	–	–
MU150010A 2.5G(1.31/1.55) Unit *3	–	○	–	–	–

○ .....Indicates slots to which the unit can be inserted.

– .....Indicates slots to which no unit can be inserted.

*1 ... Insert MP0121A and MP0122A/B at Slot 1 and Slot2, respectively to insert MP0121A and MP0122A/B at the same time.

*2 ... Use two slots, Slot 4 and Slot 5.

*3 ... MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, or MU150010A cannot be installed with MU150000A.

- Blank panel can be inserted at all the slots.

2.5G unit

- Insert the 2.5G unit of MP0127A, MP0128A, and MP0129A at Slot 1 or Slot2. Insert MP0121A and the 2.5G unit at Slot 1 and Slot 2, respectively when using the combination of MP0121A and the 2.5G unit. MP1570A operates by inserting MP0122A/B and the 2.5G unit at either Slot 1 or Slot 2 when using the combination of MP0122A/B and the 2.5G unit.
- Insert the 2.5G units of MU150008A, MU150009A, and MU150010A at Slot2. Insert MP0121A or MP0122A/B at Slot 1 and insert the 2.5G unit at Slot 2 when using the combination of MP0121A or MP0122A/B and the 2.5G unit.

2.5G/10G and 10G Optical units

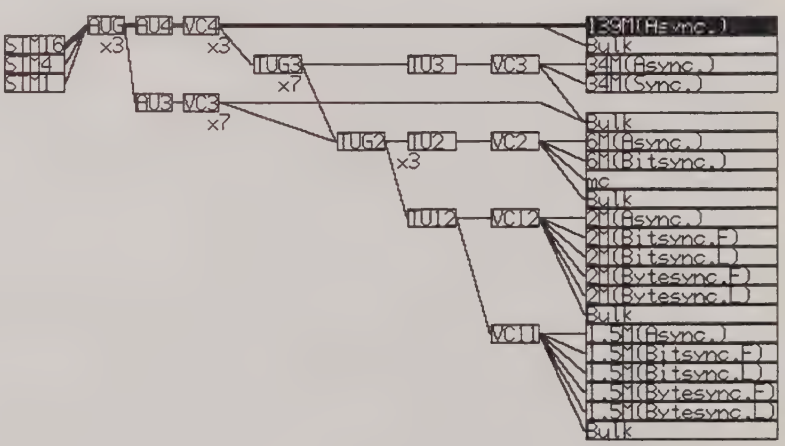
- Insert MU150000A at two slots, Slot 4 and Slot 5.
- Insert MU150001A at Slot 3. Use this unit by combining MU150000A.
- Insert MU150002A at Slot 2. Use this unit by combining MU150000A.

1.5 Mapping Route Measurable When Installing the 2.5G Unit

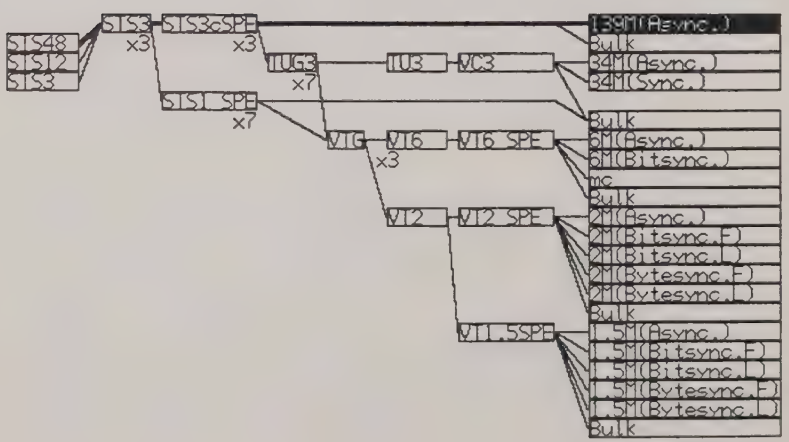
The table below shows the combination of units, measurable bit rates and mapping routes when installing the 2.5G unit.

Slot 1	Slot 2	Slot 3	Slot 4-5	Interface Unit
MP0121A	MP0127A MP0128A MP0129A MU150008A MU150009A MU150010A	*1	*2	*3

Mapping route display in SDH mode



Mapping route display in SONET mode



Combine the units in accordance with the measurement item as follow:

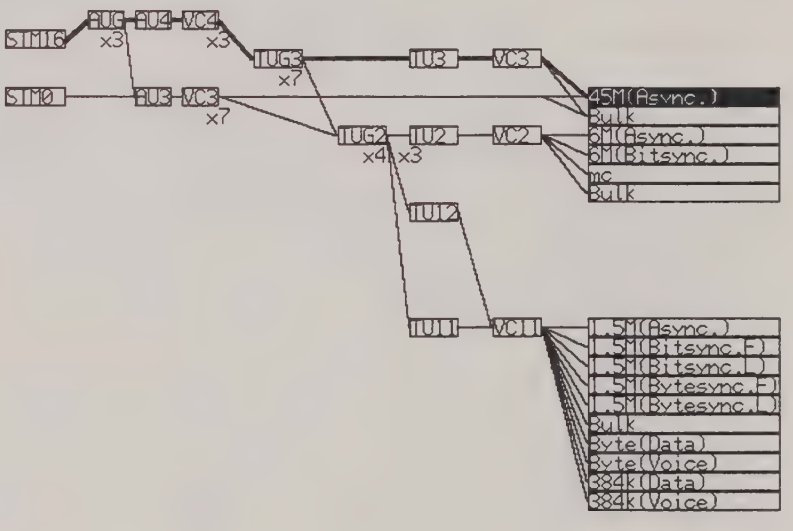
*1 ... The MP0123A ATM unit and the 2.5G jitter unit can be inserted at Slot 3. The format of measurable bit rate and mapping route does not depend on these units insertion.

*2 ... The Jitter units can be inserted at Slot 4 - 5. The format of measurable bit rate and mapping route does not depend on these units insertion.

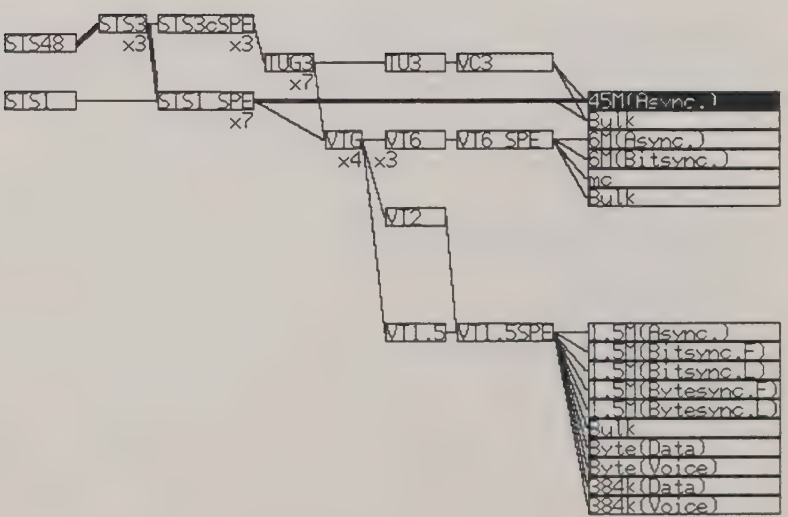
*3 ... The format of bit rate and mapping route does not depend on the 156M-type I/F unit.

Slot 1	Slot 2	Slot 3	Slot 4-5	Interface Unit
MP0122A/B	MP0127A MP0128A MP0129A MU150008A MU150009A MU150010A	*1	*2	—

Mapping route display in SDH mode



Mapping route display in SONET mode



Combine the units in accordance with the measurement item as follow:

*1 ... The MP0123A ATM unit and the 2.5G jitter unit can be inserted at Slot 3. The format of measurable bit rate and mapping route does not depend on these units insertion.

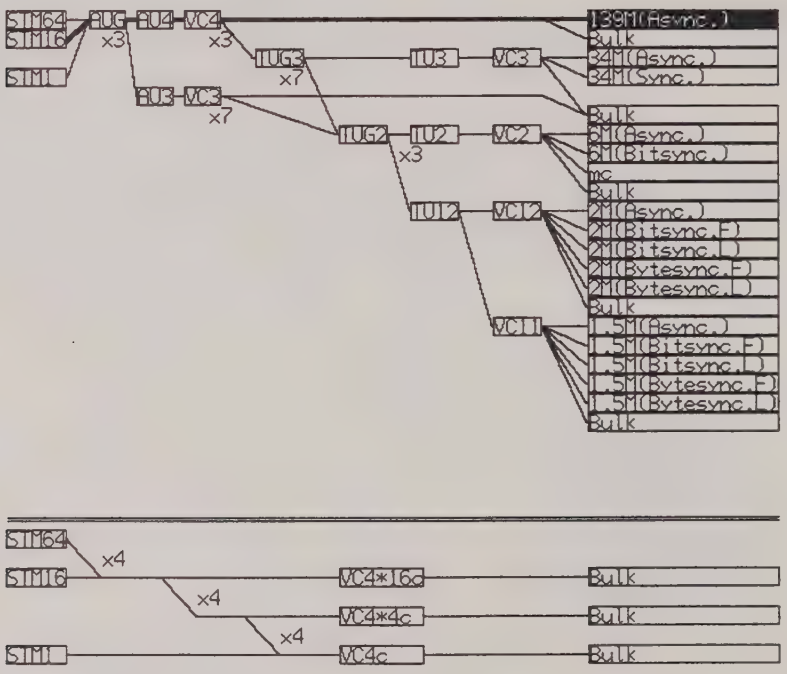
*2 ... The Jitter units can be inserted at Slot 4 - 5. The format of measurable bit rate and mapping route does not depend on these units insertion.

1.6 Mapping Route Measurable When Installing the 2.5G/10G Unit

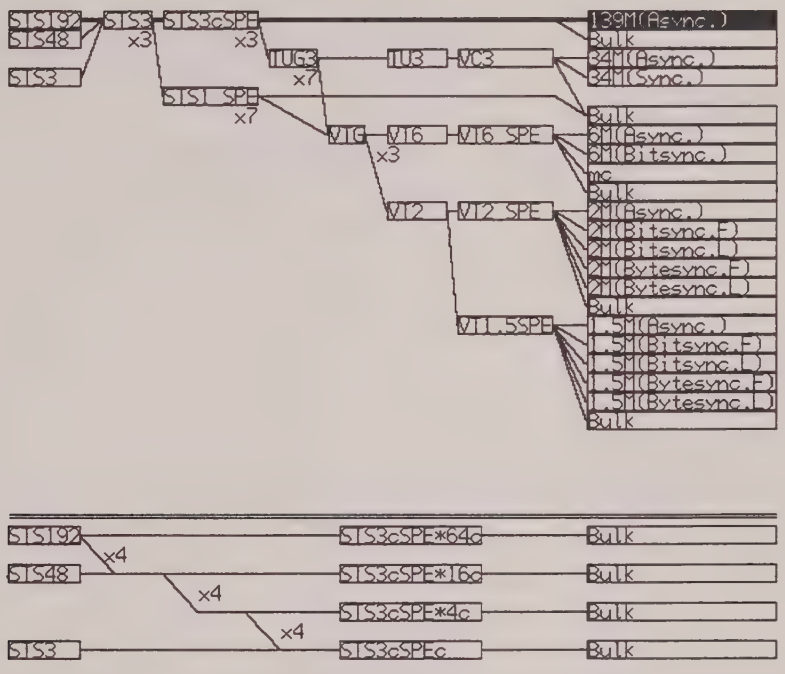
The table below shows the combination of units, measurable bit rates and mapping routes when installing the 2.5G/10G and 10G units.

Slot 1	Slot 2	Slot 3	Slot 4-5
MP0121A	MU150002A *1	MU150001A *2	MU150000A

Mapping route display in SDH mode



Mapping route display in SONET mode

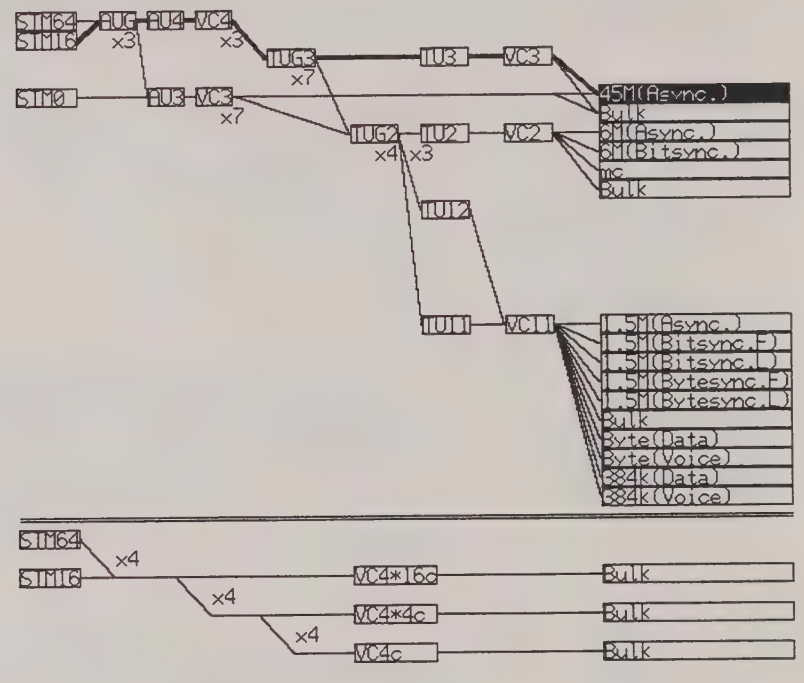


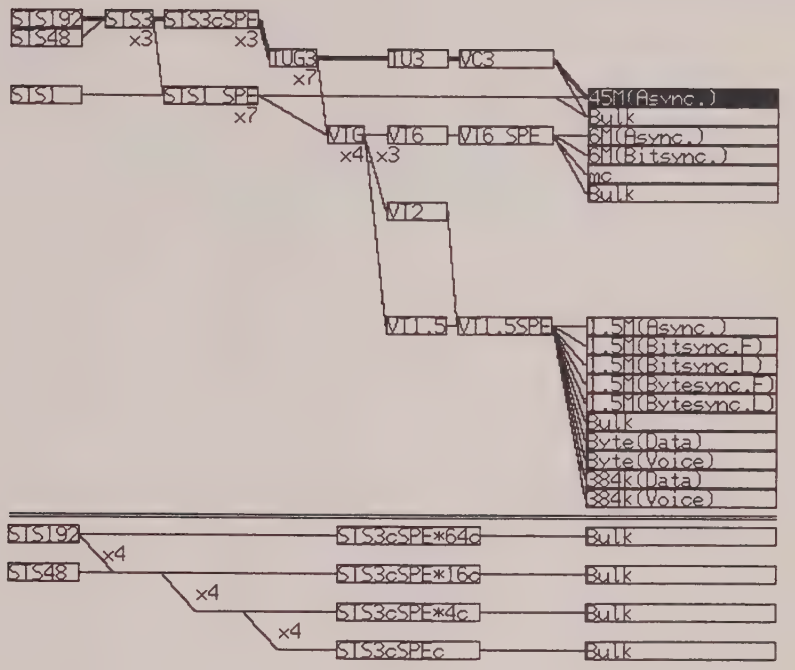
Combine the units in accordance with the measurement item as follow:

*1 ... Install it to receive the optical 10G signal.

*2 ... Install it to transmit the optical 10G signal.

Slot 1	Slot 2	Slot 3	Slot 4-5
MP0122A/B	MU150002A *1	MU150001A *2	MU150000A





Combine the units in accordance with the measurement item as follow:

*1 ... Install it to receive the optical 10G signal.

*2 ... Install it to transmit the optical 10G signal.

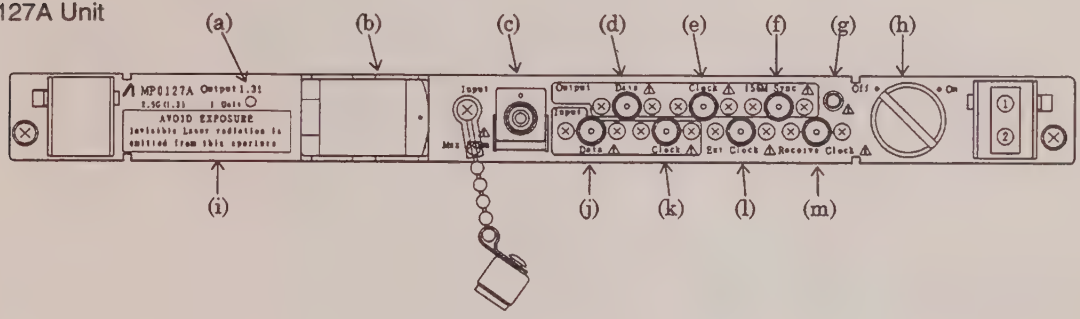
Section 2 Panel Description

This section describes each section name and function of the 2.5G, 10G Optical, and 2.5G/10G units.

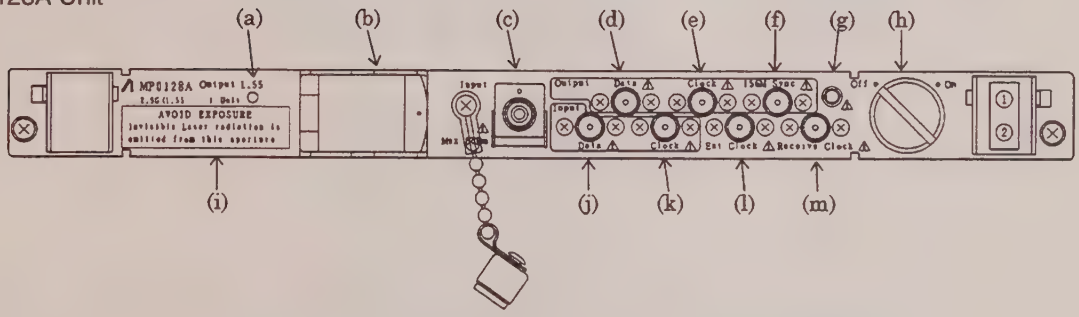
2.1 Description of the 2.5G Unit (MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, and MU150010A) Panel 2-3
2.2 Description of the 2.5G/10G (MU150001A) Unit Panel 2-8
2.3 Description of the 10G Unit (MU150001A and MU150002A) Panel 2-10

2.1 Description of the 2.5G Unit (MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, and MU150010A) Panel

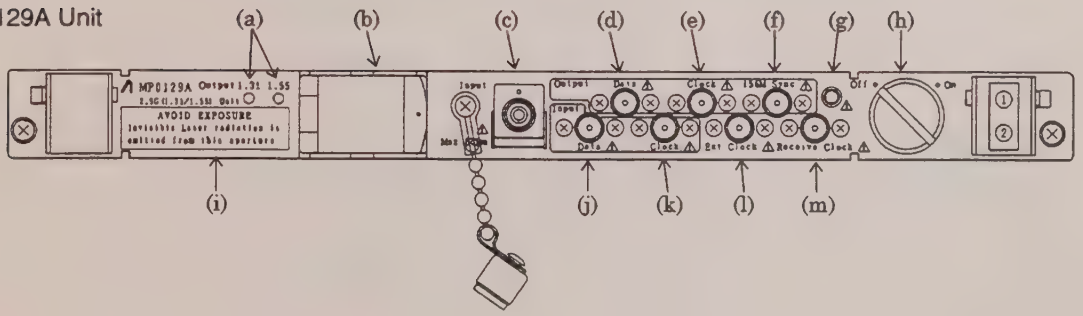
MP0127A Unit



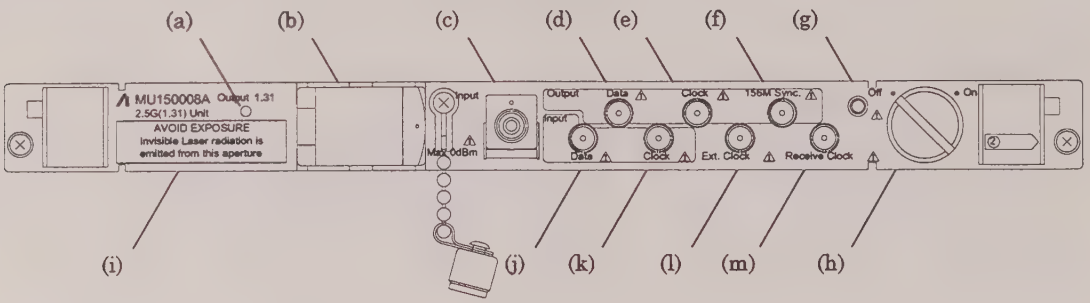
MP0128A Unit



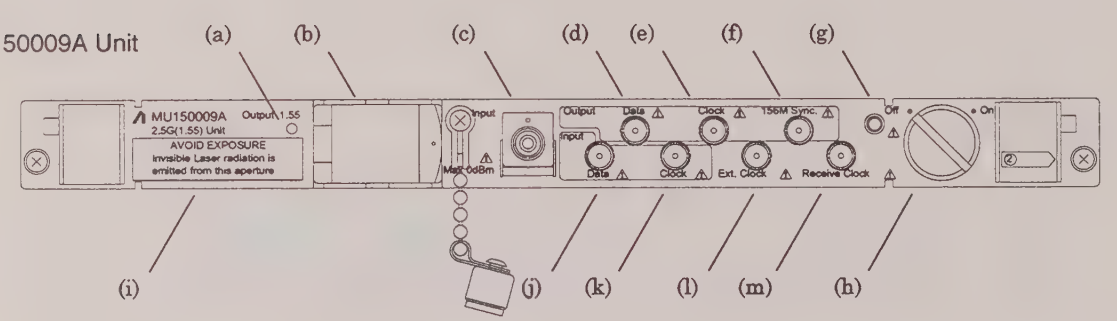
MP0129A Unit



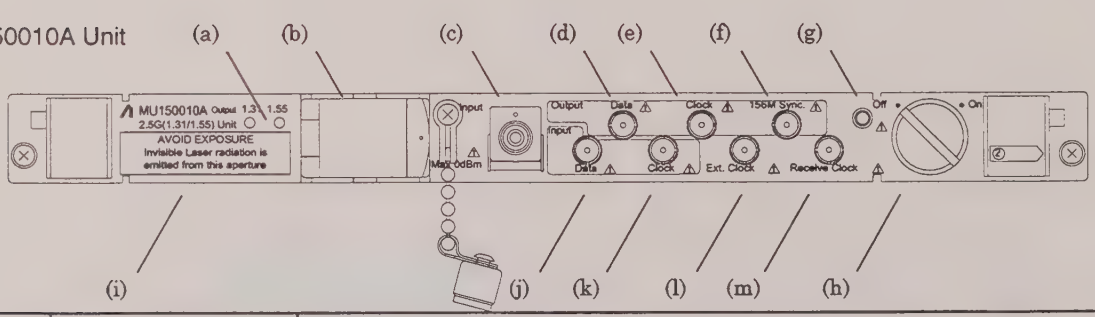
MU150008A Unit



MU150009A Unit

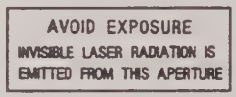


MU150010A Unit



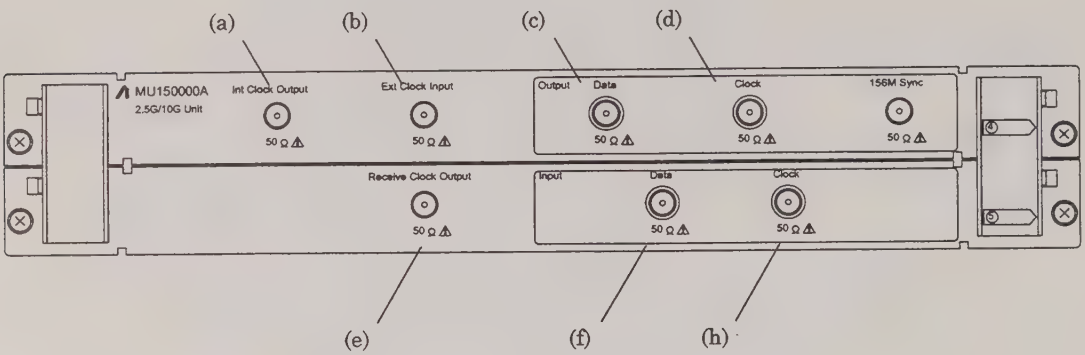
(a)	[Lamp]	Illuminated when an optical signal is output.
(b)	Optical output	Optical signal output connector When the (a) lamp is illuminated, an optical signal is being output. Bit rate .....2488.32Mbit/s Code .....NRZ Wavelength band ... 1.31 μ m (MP0127A, MU150008A) 1.55 μ m (MP0128A, MU150009A) 1.31 μ m/1.55 μ m (MP0129A, MU150010A) Side Compression ratio .....>= 30dB Optical power .....-4dBm±3dB (PN average power) Isolation .....>= 10dB 以上 Connector .....FC-PC (Single mode fiber)

(c)	Input ⚠ Max 0dBm	Optical signal input connector Both 1.31 and 1.55 can be received. Bit rate .....2488.32Mbit/s Code .....NRZ Receive light wavelength band ...1.31 μ m/1.55 μ m Level ... Narrow: - 28 to - 9 dBm (BER1 × 10^{-10} or less) Wide: - 20 to - 9 dBm (BER1 × 10^{-10} or less) Connector .....FC-PC (Single mode fiber) Absolute maximum rating ... 0 dBm (peak power) - "⚠ Max 0 dBm" indicates the absolute maximum rating of the input power level. If a signal exceeding the displayed power level is input, the MP1570A may be damaged.
(d)	Output Data	2.5G signal (data) output connector Bit rate .....2488.32Mbit/s Code .....NRZ Level .....ECL (50 Ω/-2V termination) Connector .....SMA 50 Ω
(e)	Output Clock	2.5G signal (clock) output connector Frequency .....2488.32MHz Level .....ECL (50 Ω/-2V termination) Connector .....SMA 50 Ω
(f)	Output 156M Sync	Output connector of 156M Sync. transmission clock Frequency .....155.520MHz Level .....ECL (AC) Connector .....SMA 50 Ω
(g)	[Laser remote interlock]	Laser remote interlock connector - The optical signal can be outputted only when this connector is connected.

(h)	[Key switch]	Controls the output of optical signal. On ... Enables the optical signal output. * Off ... Disables the optical signal output. *: When the (g) laser remote interlock connector is not connected to ground, even if the key switch is turned on, no optical signal can be output.
(i)		The laser light aperture label indicates the following classification under the corresponding standards of optical signals output from the (b) Output connector. - IEC 825-1 CLASS3A - 21CFR1040.10 CLASS Ⅲ b
(j)	Input Data	2.5G signal (data and monitored signal) input connector Bit rate ..... 2488.32Mbit/s Code ..... NRZ Level (data) ..... ECL (50 Ω/-2Vtermination) (monitored signal) 0.1～1.0V_{pp} (50 Ω/AC) Connector ..... SMA 50 Ω
(k)	Input Clock	2.5G signal (clock) input connector Frequency ..... 2488.32MHz Level ..... ECL (50 Ω/-2V termination) Connector ..... SMA 50 Ω
(l)	Ext. Clock	Input connector used to receive an external transmission clock This input is enabled when "External" is selected for Clock on the 'Setup: Mapping' screen. Frequency ..... 2488.32MHz Level ..... 0.8±0.3V_{pp} Connector ..... SMA 50 Ω
(m)	Receive Clock	Connector used to output a clock signal generated in the optical receiving section Frequency ..... 2488.32MHz Level ..... ECL (AC) Connector ..... SMA 50 Ω Amplitude ..... 45%～55%

- The serial number is indicated on the label at the upper panel of the unit.
- For the removing and cleaning the optical connector and attaching protective cap at optical connector, refer to the 'MP1570A SONET/SDH/PDH/ATM Analyzer Operation Manual Vol. 1 Basic Operation'.

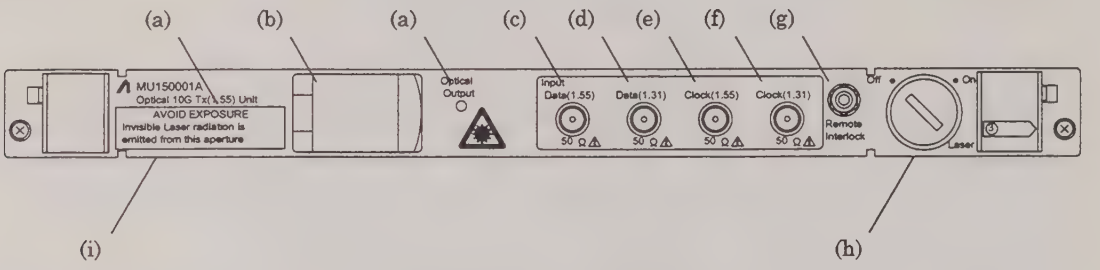
2.2 Description of the 2.5G/10G (MU150000A) Unit Panel



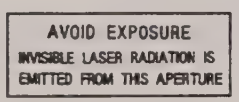
(a)	Int. Clock Output	Internal 10G signal (clock) output connector Frequency .....9953.28MHz Level .....0.6 - 1.0V(pp) Connector .....SMA 50 Ω
(b)	Ext. Clock Input	Clock input connector used when operating this equipment with external clock. When using the internal clock, connect (a) Int. Clock Output and this connector with the attached semi-rigid cable. Frequency .....2488.32, 9953.28MHz Level .....0.6 - 1.0V(pp) Connector .....SMA 50 Ω
(c)	Output Data	Data output connector Bit rate .....2488.32, 9953.28Mbit/s Code .....NRZ Level .....0/-1 ±0.3V (50 Ω, GND termination) Connector .....SMA 50 Ω
(d)	Output Clock	Clock output connector Bit rate .....2488.32, 9953.28Mbit/s Level .....0/-1 ±0.3V (50 Ω, GND termination) Connector .....SMA 50 Ω
(e)	Receive Clock Output	Connector used to output a clock signal received by (g) Input Clock connector. Frequency .....depends on (g) Input Clock connector. Level .....0/-1 ±0.3V (50 Ω, GND termination) Connector .....SMA 50 Ω
(f)	Input Data	Data input connector Bit rate .....2488.32, 9953.28Mbit/s Level .....0.65 - 1.3Vpp (50 Ω, GND termination) Connector .....SMA 50 Ω
(g)	Input Clock	Clock input connector Frequency .....2488.32, 9953MHz Level .....0.65 - 1.3Vpp (50 Ω, GND termination) Connector .....SMA 50 Ω

2.3 Description of the 10G Unit (MU150001A/B and MU150002A) Panel

2.3.1 MU150001A/B

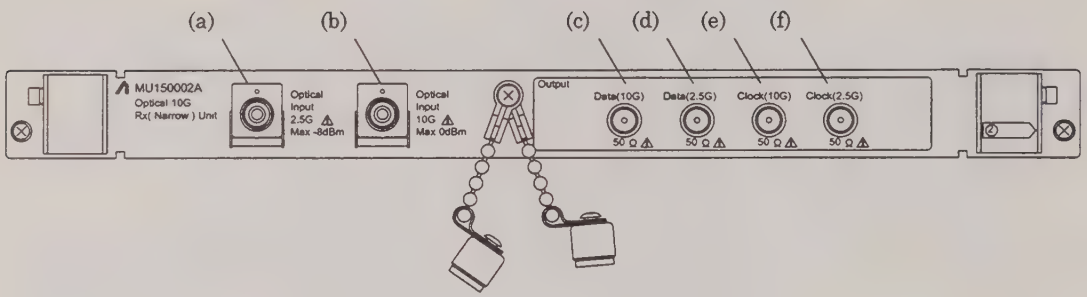


(a)	[Lamp]	Illuminated when an optical signal is output.
(b)	Optical output	Optical signal output connector When the (a) lamp is illuminated, an optical signal is being output. Bit rate .....9953.28Mbit/s, 2488.32Mbit/s (when option01, 02, or 03 is installed.) Code .....NRZ Optical power .....-4dBm±3dB (PN average power) Peak wavelength ...1545±20nm, 1315nm±50nm (when option01 or 03 is installed.) Spectrum width ..<= 1nm Side Compression ratio .....>= 30dB Isolation .....>= 8dB
(c)	Input Data (1.55)	10G and 2.5G (1550nm band) data signal input connector Input the signal to this connector when a signal (optical : 1550nm band, bit rate : 10G or 2.5G (only when option 02 or 03 is installed)) is outputted. Bit rate ..... 9953.28Mbit/s, 2488.32Mbit/s (when option 02 or 03 is installed.) Code ..... NRZ Level ..... H : 0 to -0.2, L : 0.85 to -1.2V (>=0.65Vpp) Connector ..... SMA 50 Ω
(d)	Input Data (1.31)	2.5G (1310nm band) data signal input connector Input the signal to this connector when a signal (optical : 1550nm band, bit rate : 10G or 2.5G (only when option 01 or 03, is installed)) is outputted. Bit rate ..... 2488.32Mbit/s (when option 01 or 03 is installed.) Code ..... NRZ Level ..... H : 0 to -0.2, L : 0.85 to -1.2V (>=0.65Vpp) Connector ..... SMA 50 Ω - This connector is installed only when option 01 or 03 is installed.

(e)	Input Clock (1.55)	10G and 2.5G (1550nm band) clock signal input connector Input the signal to this connector when a signal (optical : 1550nm band, bit rate : 10G or 2.5G (only when option 02 or 03 is installed)) is outputted. Bit rate .....9953.28Mbit/s, 2488.32Mbit/s (when option 02 or 03 is installed.) Code .....NRZ Level .....H : 0 to -0.2, L : 0.85 to -1.2V (>=0.65Vpp) Connector .....SMA 50 Ω
(f)	Input Clock (1.31)	2.5G (1310nm band) clock signal input connector Input the signal to this connector when a signal (optical : 1310nm band, bit rate : 2.5G (only when option 01 or 03 is installed)) is outputted. Bit rate .....2488.32Mbit/s (when option01 or 03 is installed.) Code .....NRZ Level .....H : 0 to -0.2, L : 0.85 to -1.0V Connector .....SMA 50 Ω - This connector is installed only when option 01 or 03 is installed.
(g)	[Laser remote interlock]	Laser remote interlock connector - The optical signal can be outputted only when this connector is connected.
(h)	[Key switch]	Controls the output of optical signal. On ... Enables the optical signal output. * Off ... Disables the optical signal output. *: When the (g) laser remote interlock connector is not connected to ground, even if the key switch is turned on, no optical signal can be output.
(i)		The laser light aperture label indicates the following classification under the corresponding standards of optical signals output from the (b) Output connector. - IEC 825-1 CLASS3A - 21CFR1040.10 CLASS Ⅲ b

- The serial number is indicated on the label at the upper panel of the unit.
- For the removing and cleaning the optical connector and attaching protective cap at optical connector, refer to the 'MP1570A SONET/SDH/PDH/ATM Analyzer Operation Manual Vol. 1 Basic Operation'.

2.3.2 MU150002A



(a)	Optical Input 2.5G ⚠ Max -8dBm	Optical signal (2.5G) input connector Bit rate .....2488.32Mbit/s Code .....NRZ Receive light wavelength band ...1310nm and 1550nm bands Input Level ...- 29 to -10 dBm (BER1 × 10^{-11}) Connector .....FC-PC (Single mode fiber) Absolute maximum rating ...-8dBm (average power) - "⚠ Max -8 dBm" indicates the absolute maximum rating of the input power level. If a signal exceeding the displayed power level is input, the MP1570A may be damaged. - This connector is installed only when option 01 is installed.
(b)	Optical Input 10G ⚠ Max 0dBm	Optical signal (10G) input connector Bit rate .....9953.28Mbit/s Code .....NRZ Receive light wavelength band ...1550nm bands Input Level ...- 13 to -3 dBm (BER1 × 10^{-12}) Connector .....FC-PC (Single mode fiber) Absolute maximum rating ...0dBm (average power) - "⚠ Max -0 dBm" indicates the absolute maximum rating of the input power level. If a signal exceeding the displayed power level is input, the MP1570A may be damaged.

(c)	Output Data (10G)	10G signal (data) output connector Bit rate .....9953.28Mbit/s Code .....NRZ Level .....1.0±0.3V(pp) Connector .....SMA 50 Ω
(d)	Output Data (2.5G)	2.5G signal (data) output connector Bit rate .....2488.32Mbit/s Code .....NRZ Level .....1.0±0.3V(pp) Connector .....SMA 50 Ω - This connector is installed only when option 01 is installed.
(e)	Output Clock (10G)	10G signal (clock) output connector Frequency .....9953.28MHz Level .....0.65 - 1.0V(pp) Connector .....SMA 50 Ω
(f)	Output Clock (2.5G)	2.5G signal (clock) output connector Frequency .....2488.32MHz Level .....1.0±0.3V(pp) Connector .....SMA 50 Ω - This connector is installed only when option 01 is installed.

Section 3 Screen Description

This section describes screens displayed when the 2.5G, 2.5G/10G, or 10G unit is installed to MP1570A.

3.1 Screen Configuration 3-3
3.1.1 Subscreens of 'Setup' Main Screen 3-3
3.1.2 Subscreens of 'Test menu' Main Screen 3-4
3.1.3 Subscreens of 'Result' Main Screen 3-4
3.1.4 Subscreens of 'Analyze' Main Screen 3-5
3.2 Description of 'Setup : Mapping' subscreen 3-6

3.1 Screen Configurations

Composition of main screens and subscreens when the 2.5G, 2.5G/10G, or 10G unit is installed to MP1570A are as listed in the following table.

3.1.1 Subscreens of 'Setup' Main Screen

Display	Description
Mapping	Selects the type of signal, the interface, and measurement conditions, according to the measured item,.
Memory	Saves and retrieves the measurement condition data and graphic data on the Analyze screen.
Print	Sets the printing conditions.
OH preset data	Presets the overhead conditions of send signal.
Tandem	Sets the tandem connection measurement.
Dummy preset	Sets the dummy channel.
APS program data	Sets the APS (Automatic Protection Switch) measurement of transmission line.
System	Sets the buzzer, clock, screen color, GPIB and RS-232C.
Floppy disk	Saves the measurement conditions data and graphic data of Analyze main screen in the floppy disk, retrieves them from the disk.
Custom function	Sets specific functions that cannot be set on other screens.
Measurement condition	Sets the error and alarm detection release conditions, tandem connection conditions and performance measurement conditions.
PTR64 frame	Sets the pointer value to generate 64 frames of SDH pointer.
OH change data	Presets the OH change data pattern of the SDH OH test function.
Frame memory	Sets the frame memory to be sent.
Signaling preset	Sets the signaling data.
Selftest	Performs the self test.
Auto setup	Automatically sets the bit rate according to the input signal.

3.1.2 Subscreens of 'Test menu' Main Screen

Display	Description
Trouble search	Sets the measurement conditions of trouble search.
Manual	Sets the conditions of manual measurement.
Pointer sequence	Sets the type and time interval of pointer sequence measurement.
Delay	Sets the conditions of delay measurement.
OH test	Sets the conditions of overhead test.
APS test	Sets the APS test conditions.
Performance check	Sets the performance check conditions.
Frame memory	Sets the frame transmission conditions.

3.1.3 Subscreens of 'Result' Main Screen

Display	Description
Trouble search	Displays the trouble search measurement results.
Error / Alarm	Displays the error and alarm measurement results.
Justification	Displays the justification measurement results.
Zoom	Zooms up the error and alarm measurement results.
Performance	Displays the performance measurement results.
B2 error	Displays the B2 measurement results.
Simultaneous	Displays the simultaneous errors and alarms measurement results of VC2(7ch), VC12(21ch) and VC11(28ch) of TUG3 or VC-3.
Delay	Displays the delay measurement results.
APS test	Displays the APS test measurement results.
Recall	Displays the automatic measurement results.

3.1.4 Subscreens of 'Analyze' Main Screen

Display	Description
Trouble search	Analyzes the trouble search measurement result.
Error / Alarm	Displays the error and alarm measurement result on graphs.
OH monitor	Displays the overhead monitor result together with the path trace, payload, pointer value, and K1/K2 byte monitor result.
Opt. power meter	Displays the power monitor, wavelength setting and optical power of the optical signal.
Pointer monitor	Monitors the SDH pointer value.
Sequence test	Analyzes the automatic measurement result.
APS capture	Set the capturing of K1/K2 byte used in the APS test, and analyzes it.
OH capture	Set the capturing of 1,023 bytes of SDH overhead, and analyzes it.
Frame capture	Set the capturing of SDH framed, and displays the result.
Recall	Displays the graph data stored in the memory or floppy disk.

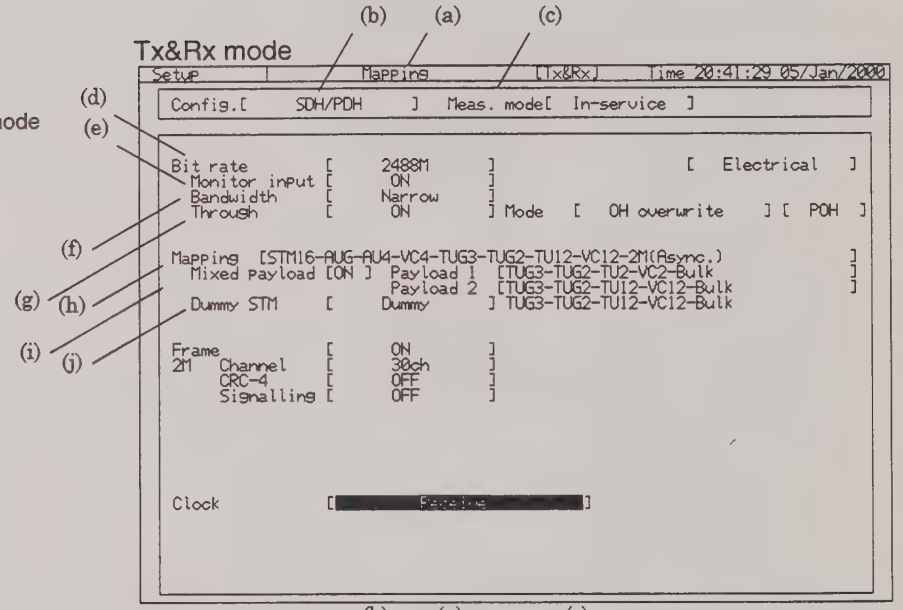
3.2 'Setup : Mapping' subscreen

The basic setting of measurement condition is performed on this screen.

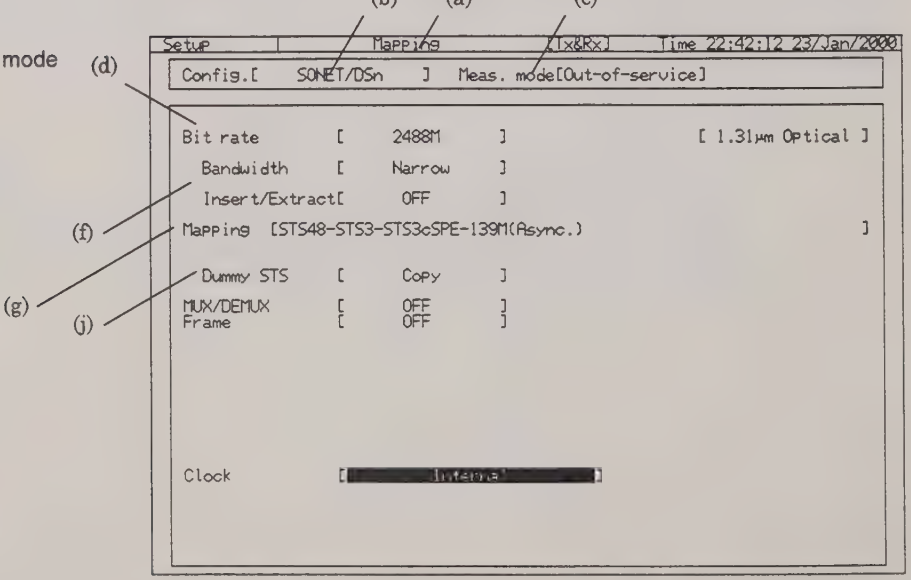
- If settings on this screen are changed during measurement, the measurement restarts.
- If the Tx&Rx operation mode is specified, items related to both TX and RX can be set together. If Tx/Rx is specified, items related to Tx and Rx can be set individually.

Tx&Rx mode

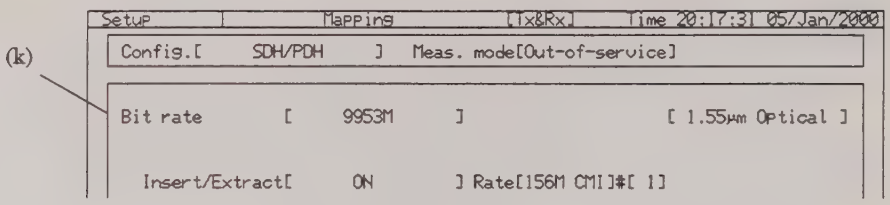
Display in SDH mode



Display in SONET mode



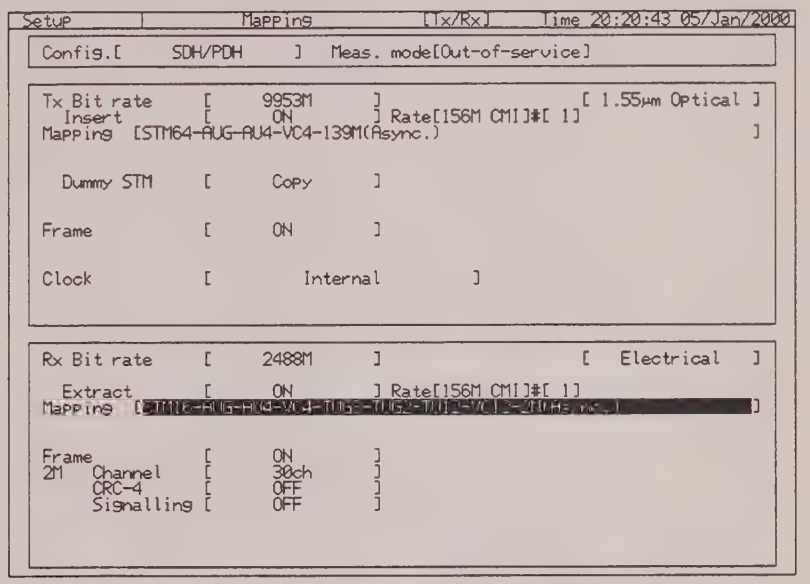
	Display	Description
(a)	[Subscreen selection]	Select a subscreen of the Setup main screen. Also select subscreens of other main screens at this position.
(b)	Config.	Set the configuration to "SDH/PDH"
(c)	Meas. mode	Select the measurement mode from "In-service" and "Out-of-service".
(d)	Bit rate	Select the bit rate for TX and RX. For 2488 M bit rate, set the 2.5G signal input/output type as below: 1.31 μ m Optical ... 1.31 μ m band light-source input/output 1.55 μ m Optical ... 1.55 μ m band light-source input/output Electrical ... Electrical input/output
(e)	Monitor input	Set the Monitor input to On/Off of the 2.5G unit. When On, the measurement is enabled if the electrical input is data only.
(f)	Bandwidth	Set the bandwidth of 2.5G unit, as below: Narrow ... - 29 to - 9 dBm Wide ... - 20 to - 9 dBm - Used when the receive 2.5G interface is "Optical" or the Monitor input is On.
(g)	Through	Set the Through mode. Select the mode from "Transparent through", "OH overhead", and "Payload overhead" to turn On the through mode.
(h)	Mapping	Select a mapping. - Selectable mappings depend on the installed unit. For the details, see "1.5 Mapping Route Measurable When Installing the 2.5G Unit" and "1.6 Mapping Route Measurable When Installing the 2.5G/10G and 10G Units".
(i)	Mixed payload	Select "ON" and press the Set key to specify a different mapping (PDH signal) from the main channel mapping to be measured when their channels are the same and the mapping route set by (i) passes through TUG3 or TUG2. Then set Payload1 and Payload2 when the mixed payload edit screen is displayed.
(j)	Dummy STM	Set "Dummy" to send the dummy channel signal with the content set on the Setup: Dummy preset screen. (Set "Copy" to copy the measurement channel payload to the dummy channel so that the signal is sent. For the details, see "6.6 Editing Dummy Channel" in Vol. 1 or Vol. 2 of the Operation Manual.)



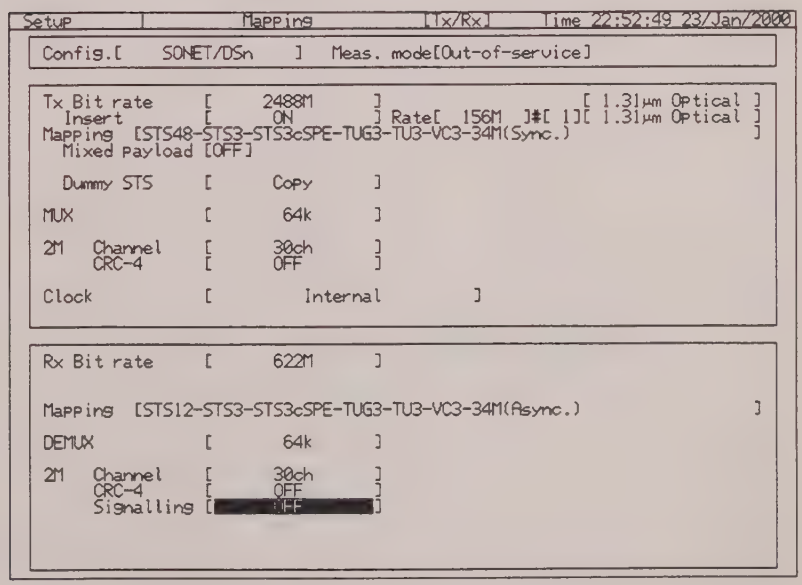
	Display	Description
(k)	Insert/Extract	Set On/Off of Insert/Extract. - This item can be set when MU150008A, MU150009A, or MU150010A is installed.

Tx/Rx mode

Display in SDH mode


Setup
Mapping
[Tx/Rx]
Time 20:20:43 05/Jan/2000
Config.[SDH/PDH] Meas. mode[Out-of-service]
Tx Bit rate [9953M]
[1.55μm Optical]
Insert [ON] Rate[156M CMI]#[1]
Mapping [STM64-AUG-AU4-VC4-139M(Async.)
Dummy STM [Copy]
Frame [ON]
Clock [Internal]
Rx Bit rate [2488M]
[Electrical]
Extract [ON] Rate[156M CMI]#[1]
Frame [ON]
2M Channel [30ch]
CRC-4 [OFF]
Signalling [OFF]

Display in SONET mode



- Set items related to TX at the top of the screen. Set items related to RX at the bottom of the screen. The displayed contents are the same as those displayed when Tx&Rx is specified.

Section 4 Application Examples

This section describes application examples using the 2.5G, 10G optical, and 2.5G/10G units.

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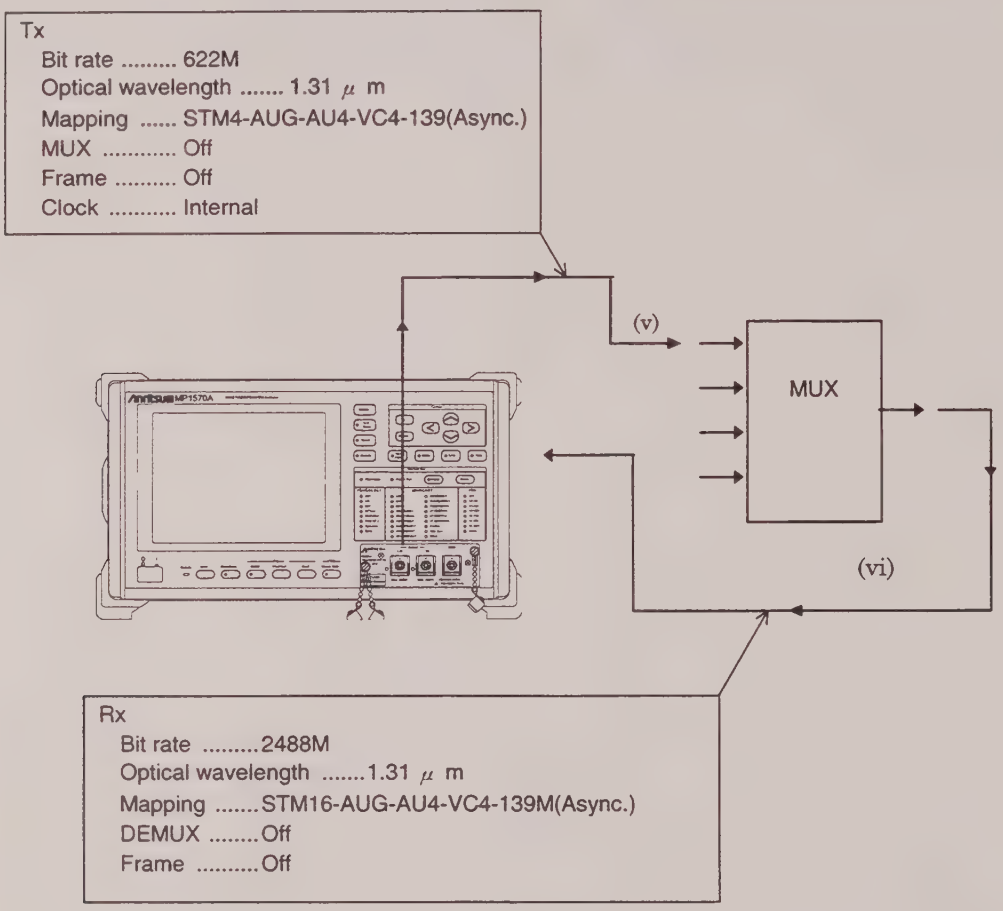
4.1 Evaluation Test of 622M-2488M MUX

Procedures are described in the following pages to evaluate the multiplexing unit MUX (Multiplexer) that multiplexes the 622M bit/s signal and outputs the 2488M bit/s signal.

4.1.1 Connection of Measurement System

Connect MUX to MP1570A by referring to the following figure:



(i) Turn Off the power switch of MP1570A.

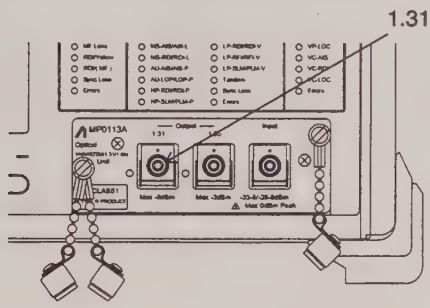
(ii) Install MP0121A to MP1570A.

(iii) Install the 2.5G unit (MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, or MU150010A) to MP1570A.

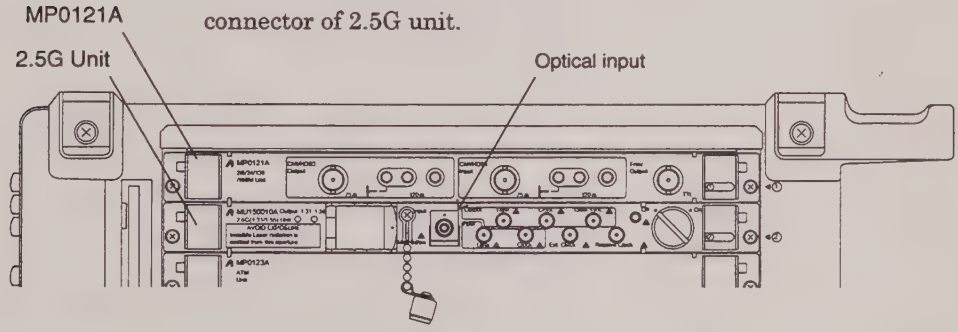
- Install MU150008A or MU150010A when using the Insert/Extract functions.

(iv) Install the MP0111A or MP0113A optical interface unit to MP1570A.

(v) Connect the 1.31 μ m Optical output connector of optical interface unit to the input connector of MUX.



(vi) Connect the output connector of MUX to the Optical Input connector of 2.5G unit.



(vii) Turn On the power switch of MP1570A after the connection.

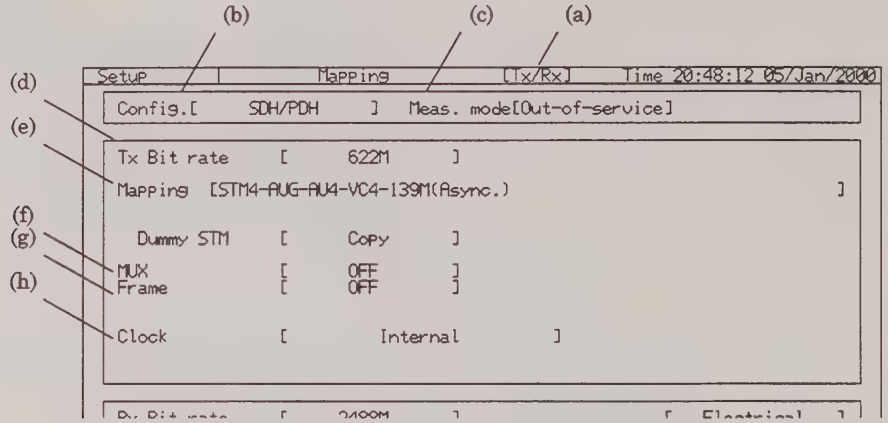
CAUTION ⚠

Check that the optical output does not exceed the maximum rated input power level of the unit under measurement when connecting the optical output of the optical interface unit or the 2.5 G unit to the unit under measurement. Also check that the optical output does not exceed the maximum rated input power level of units when connecting the optical output of the unit under measurement to the optical interface unit and the 2.5 G unit. If an optical signal exceeding the maximum rated power level is input, the internal circuit or device may be damaged.

4.1.2 Basic Setting *Setup: Mapping screen*

(1) Display the Setup: Mapping screen.

(2) Set the screen parameters.



(a) [Operation mode] ... Set the TX and RX mode to "Tx/Rx".

(b) Config. ... Set the configuration to "SDH/PDH".

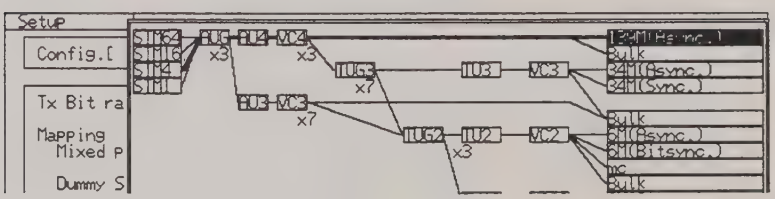
(c) Meas. mode ... Set the measurement mode to "Out-of-service".

Setting of Tx (sender)

(d) Tx Bit rate ... Set the TX bit rate to "622M".

(e) Mapping ... Set the mapping to "STM4-AUG-AU4-VC4-139 (Async.)"

- Place the cursor on "Mapping" and press [Set] to open the mapping selection window. Select the mapping by using [∧] [∨] [<] [>] and press [Set].

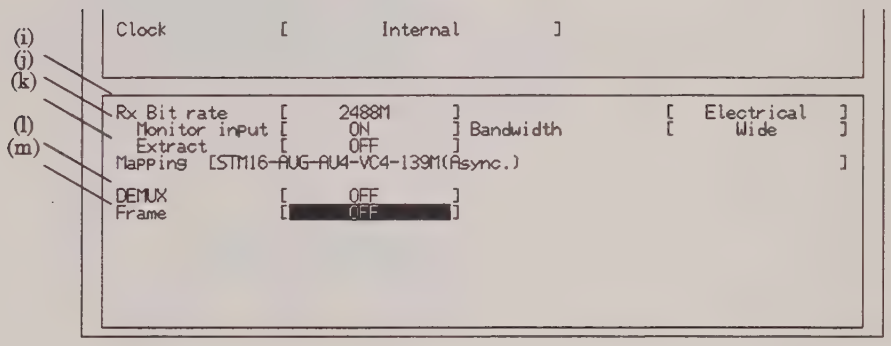


(f) MUX ... Set MUX to "OFF".

(g) Frame ... Set the frame at the lowest PDH level to "OFF".

(h) Clock ... Set the clock source of TX signal to "Internal" (clock built in MP1570A).

Setting of Rx (receiver)



(i) Rx Bit rate ... Set the RX bit rate to "2488M".

(j) Monitor input ... Set the On/Off of monitor input.

(k) Extract ... Set the On/Off of extract. In this example, set it to "OFF". This parameter can be set when the MU150008A, MU150009A, or MU150010A is installed

(l) Mapping ... Set the mapping to "STM16-AUG-AU4-VC4-139 (Async.)".

(m) DEMUX ... Set DEMUX to "OFF".

- This is displayed when the option of MUX/DEMUX is installed.

(n) Frame ... Set the frame at the lowest PDH level to "OFF".

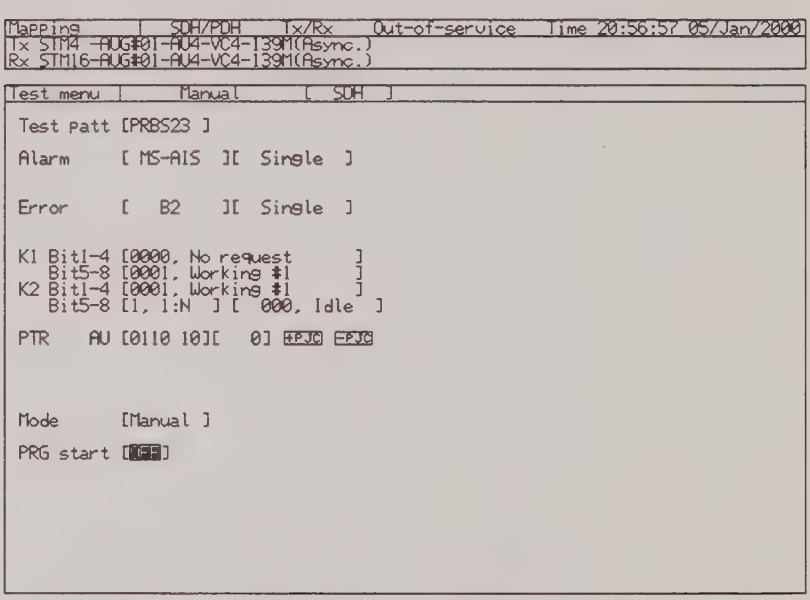
4.1.3 Manual Measurement

Manual measurement enables error or alarm testing, performance measurement, and justification measurement for one channel.

Starting the Setting and the Measurement *Test menu: Manual screen*

(1) Display Test menu: Manual.

(2) Set the screen parameters.


Mapping | SDH/PDH Tx/Rx Out-of-service Time 20:56:57 05/Jan/2000
Tx STM4 -AUG#01-AU4-VC4-139M(Async.)
Rx STM16-AUG#01-AU4-VC4-139M(Async.)
Test menu [Manual [SDH]
Test patt [PRBS23]
Alarm [MS-AIS][Single]
Error [B2][Single]
K1 Bit1-4 [0000, No request]
Bit5-8 [0001, Working #1]
K2 Bit1-4 [0001, Working #1]
Bit5-8 [1, 1:N] [000, Idle]
PTR AU [0110 10][0] +PJC -PJC
Mode [Manual]
PRG start [OFF]

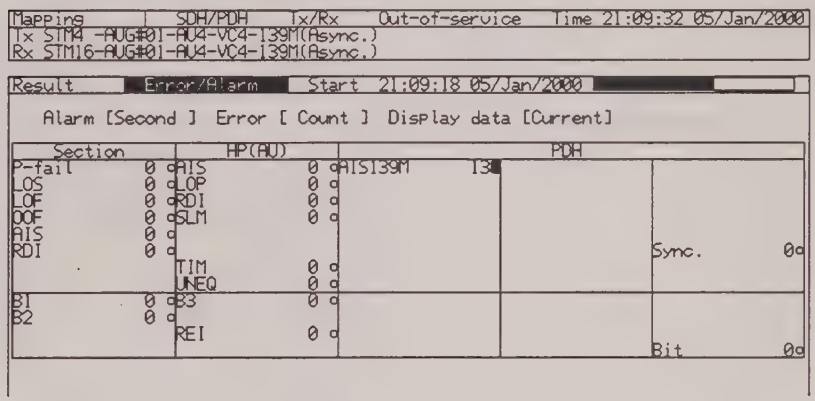
- Select a channel at the top of the mapping screen.
- Set the measurement time in Mode.
- To add an error or an alarm, press Error or Alarm on the panel.

(3) Measurement results shown in the following pages can be displayed by pressing Start /Stop to start the measurement after the above setting.

Display of the Error/Alarm Measurement Result *Result : Error/Alarm screen*

(1) Display the Result: Error/Alarm screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) A measurement result of error or alarm is displayed.

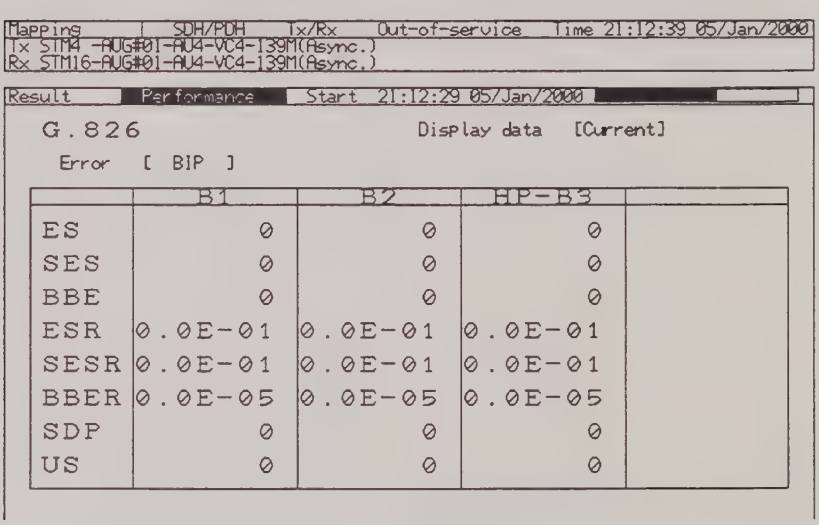


- The number of errors or the error rate can be selected.
- If current of Display data is selected, the intermediate result during measurement is displayed.

Display of the Performance Measurement Result *Result:Perfromance screen*

(1) Display the Result: Performance screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The measurement result of performance selected on the Setup: Measurement condition screen is displayed. (For the performance setting, refer to "6.8.3 Setting of Measurement Condition" of the MP1570A Operation Manual Vol. 1 (Basic Operation).

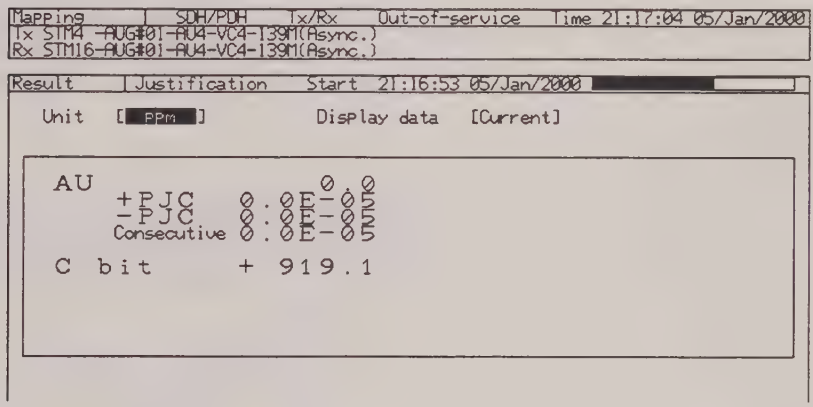


- If "Current" of Display data is selected, the intermediate result during measurement is displayed.

Display of the Justification Measurement Result *Result: Justification screen*

(1) Display the Result: Justification screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The numbers of NDF, + PJC, - PJC, and C-bit justifications are displayed (when Async. of Mapping is selected).

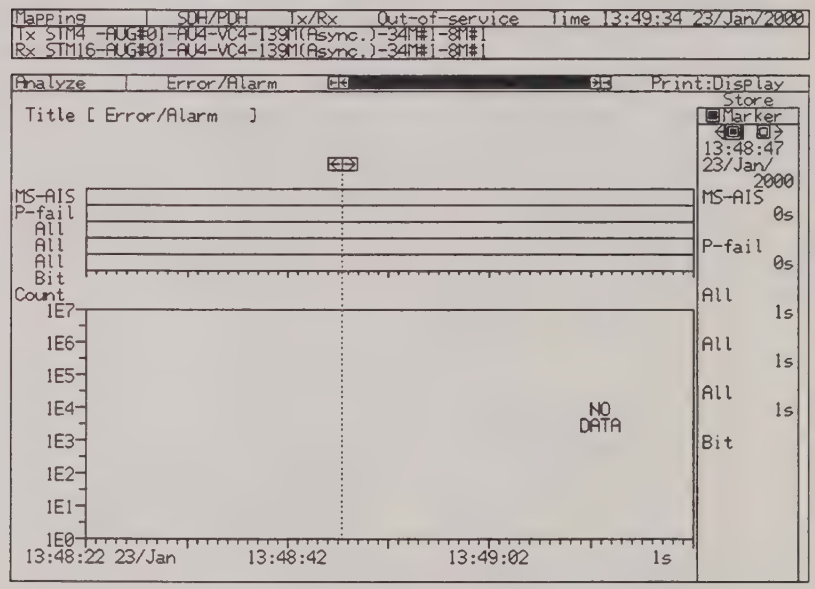


- If "Current" of Display data is selected, the intermediate result during measurement is displayed.

Analysis of the Error/Alarm Measurement Result *Analyze: Error/Alarm screen*

(1) Display the Analyze: Error/Alarm screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The analyzed result of error and alarm is displayed.Test menu : Manual.



- If single screen display mode, five items or one error item can be displayed.
- If "ALL" is selected at alarm item, the logical sum of all alarms is displayed.
- If Marker is set to On, detailed data of the searched location is displayed.

Other analysis

If the Analyze: OH Monitor screen is displayed, the K1 byte, K2 byte, AU Pointer, SOH 9×9 bytes, and Path trace can be monitored.

PTR, K1/K2

```
Mapping      | SDH/PDH   Tx/Rx   Out-of-service   Time 14:00:15 23/Jan/2000
Tx STM4 -AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1
Rx STM16-AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1

Analyze      |  OH monitor

 Type [ PTR,K1/K2 ]          Pause

  K1 Bit1-4 : 0000  No request
     Bit5-8 : 0001  Working #1
  K2 Bit1-4 : 0001  Working #1
     Bit5   :    1  1:N architecture
     Bit6-8 :  000  Reserved

  AU PTR    : 0110 10    5
```

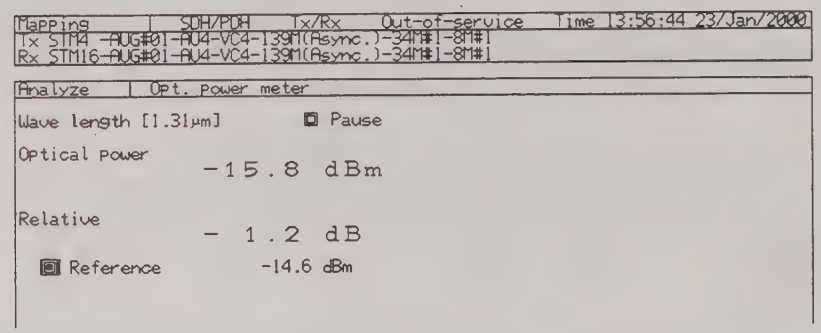
SOH 9×9

```
Mapping      | SDH/PDH   Tx/Rx   Out-of-service   Time 13:58:32 23/Jan/2000
Tx STM4 -AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1
Rx STM16-AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1

Analyze      |  OH monitor

 Type [   OH    ]          Pause

 SOH #[ 1]                          POH
   1 17 33 49 65 81 97113129        VC4
 1F6 F6 F6 28 28 28 01 AA AA        J100
 2CC 00 00 00 00 00 00 00 00        B300
 300 00 00 00 00 00 00 00 00        C212
 468 9B 9B 05 FF FF 00 00 00        G100
 5AC 4C 3D 01 00 00 18 00 00        F200
 600 00 00 00 00 00 00 00 00        H400
 700 00 00 00 00 00 00 00 00        F300
 800 00 00 00 00 00 00 00 00        K300
 900 00 00 00 00 00 00 00 00        N100

     S1 : Quality Unknown
 VC4 C2 : Async. 139M(C-4)          G1 : No remote defect
```

Path trace

```
Mapping      | SDH/PDH   Tx/Rx   Out-of-service   Time 14:02:33 23/Jan/2000
Tx STM4 -AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1
Rx STM16-AUG#01-AU4-VC4-139M(Async.)-34M#1-8M#1

Analyze      |  OH monitor

 Type [Path trace]          Pause

  J0        : ssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssss
    CRC-7   :
    TIM     : O

  J1-HP     : ssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssss
    CRC-7   :
    TIM     : O
```

If the Analyze: Opt. power meter screen is displayed, the optical power can be monitored.

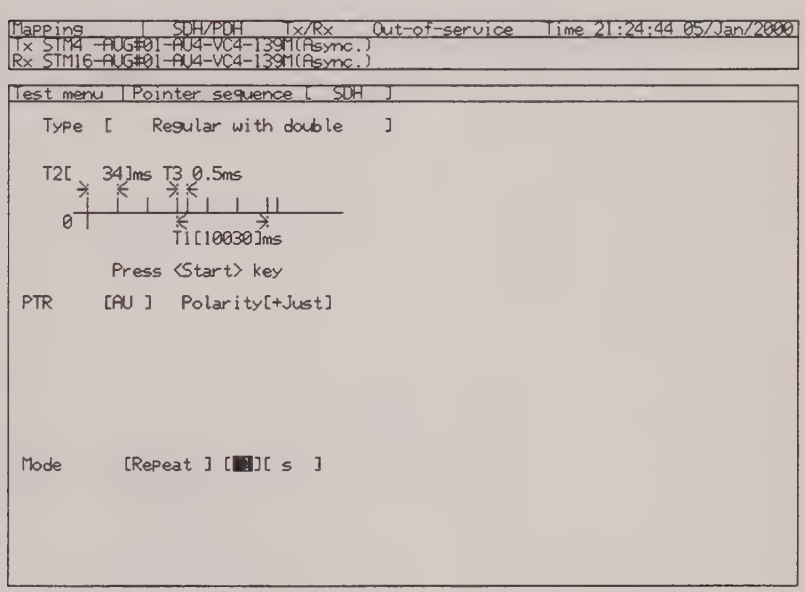


4.1.4 Measurement of Pointer Sequence *Test menu: Pointer sequence screen*

The pointer sequence measurement generates a sequence of the pointer specified by ITU-TG.783. The procedures are explained as follow:

(1) Display the Test menu: Pointer sequence screen.

(2) Set the screen parameters.


Mapping | SDH/PDH Tx/Rx Out-of-service Time 21:24:44 05/Jan/2000
Tx STM4 -AUG#01-AU4-VC4-139M(Async.)
Rx STM16-AUG#01-AU4-VC4-139M(Async.)
Test menu | Pointer sequence [SDH]
Type [Regular with double]
T2[34]ms T3 0.5ms
0
T1[10030]ms
Press <Start> key
PTR [AU] Polarity[+Just]
Mode [Repeat] [ ][s]

- Select a channel at the top of the mapping screen.
- In the figure above, the Regular with double sequence is generated on the AU pointer.

(3) Press Start /Stop to start the measurement.

(4) A measurement result can be displayed and analyzed in the same manner as in manual measurement.

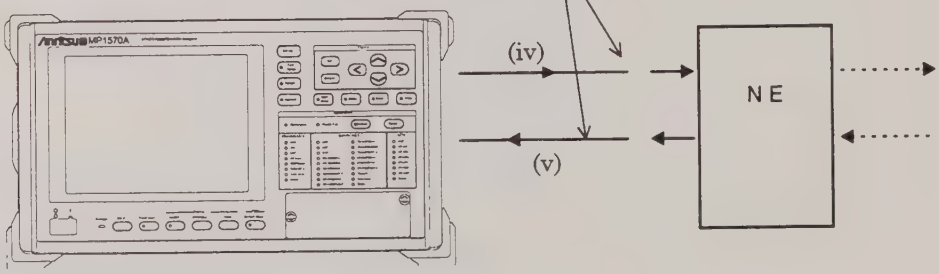
4.2 2488M-2488M Measurement

This section describes measurement examples by connecting NE (Network element) of 2488M to MP1570A.

4.2.1 Connection of Measurement System

Connect MUX to MP1570A by referring to the following figure:

Tx & Rx
- Bit rate 2488M
- Optical wavelength ..... 1.55 μ m
- Mapping ..... STM16-AUG-AU4-VC4-TUG3-TUG2-VC12-2M(Async.)
- Insert/Extract .....Off
- Dummy STM .....Copy
- MUX/DEMUX .....Off
- Frame ..... Off
- Clock ..... Internal
- 2M Channel.. 30ch
  - CRC-4 .... Off
  - Signalling Off
- Tx Clock ..... Internal



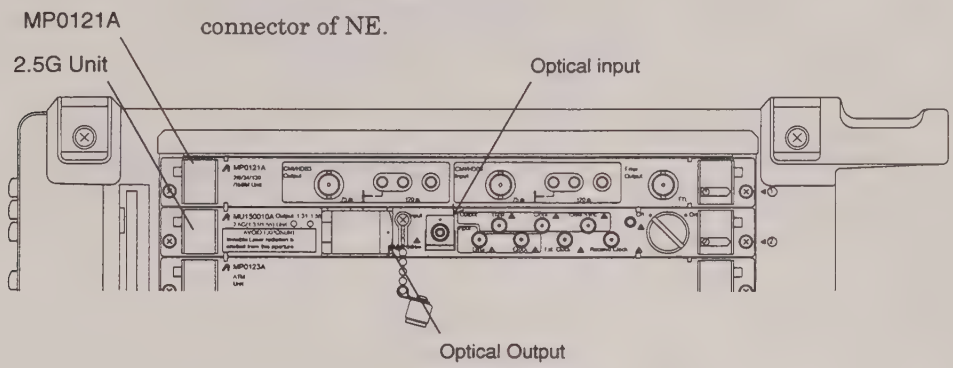
(i) Turn Off the power switch of MP1570A.

(ii) Install MP0121A to MP1570A.

(iii) Install the 2.5G unit that can output optical signals (MP0128A, MP0129A, MU150009A, or MU150010A) to MP1570A.

- Install MU150008A, MU150009A, or MU150010A when using the Insert/Extract functions.

(iv) Connect the Optical Output connector of 2.5G unit to the input connector of NE.



(v) Connect the output connector of NE to the Optical Input connector of 2.5G unit.

(vi) Turn On the power switch of MP1570A after the connection.

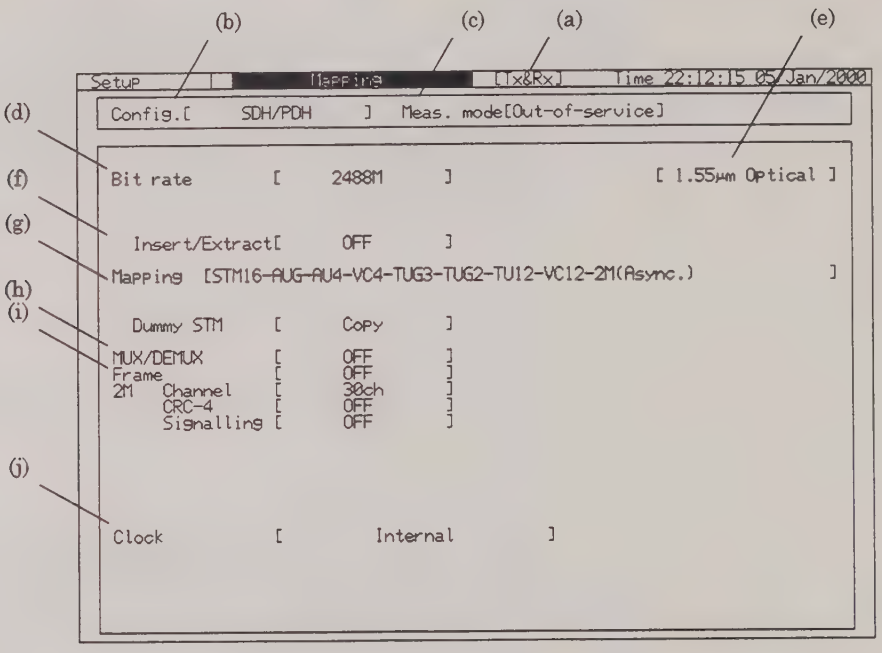
CAUTION ⚠

Check that the optical output does not exceed the maximum rated input power level of the unit under measurement when connecting the optical output of 2.5 G unit to the unit under measurement. Also check that the optical output does not exceed the maximum rated input power level of units when connecting the optical output of the unit under measurement to the optical interface unit and the 2.5 G unit. If an optical signal exceeding the maximum rated power level is input, the internal circuit or device may be damaged.

4.2.2 Basic Setting *Setup : Mapping screen*

(1) Display the Setup: Mapping screen.

(2) Set the screen parameters.



(a) [Operation mode] ... Set the TX and RX mode to "Tx&Rx".

(b) Config. ... Set the configuration to "SDH/PDH".

(c) Meas. mode ... Set the measurement mode to "Out-of-service".

(d) Bit rate ... Set the bit rate of TX and RX to "2488M".

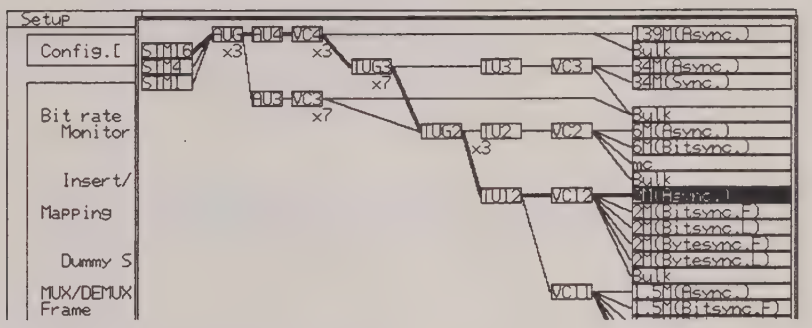
(e) [Interface] ... Set the bandwidth to "1.55 μ m Optical".

(f) Insert/Extract ... Set the On/Off of insert.

- This can be set when MU150008A, MU150009A, or MU150010A is installed.

(g) Mapping ... Set the mapping to "STM4-AUG-AU4-VC4-TUG3-TUG2-VC12-2M (Async.)".

- Place the cursor on "Mapping" and press [Set] to open the mapping selection window. Select the mapping by using [∧] [∨] [<] [>] and press [Set].



(h) MUX/DEMUX ... Set it to "OFF".

(i) Frame ... Set the frame at the lowest PDH level to "OFF".

(j) Clock ... Set the clock source of TX signal to "Internal" (clock built in MP1570A).

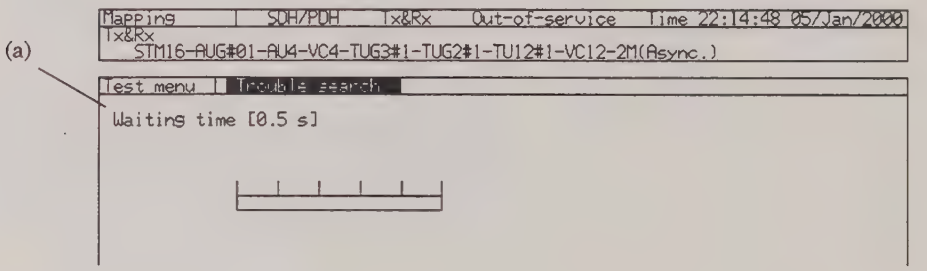
4.2.3 Continuity Test for All Channels by the Trouble Search Function

MP1570A enables the continuity test by using the trouble (error and alarm) search function for all channels of mapping route set on the Setup: Mapping screen. The measured result of errors and alarms of each channel is displayed. The test procedures are explained as follow:

Starting the Setting and Search *Test menu : Trouble search screen*

(1) Display the Test menu: Trouble search screen.

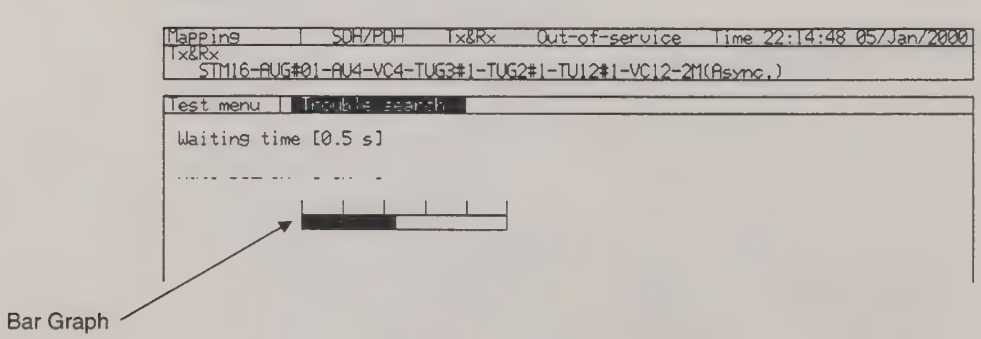
(2) (2) Set the parameters on the screen.



(a) Waiting time ... Set the time required for the stable test signal switch. If the time setting is not necessary, set the minimum 0.5 s.

(3) Press Start /Stop to start the measurement.

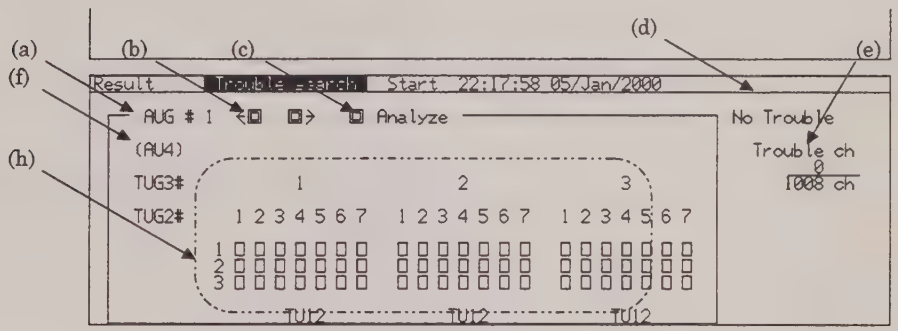
(4) The measurement progress is displayed in the bar graph on the screen.



Display of Search Result *Result : Trouble search screen*

(1) Display the Result: Trouble search screen.

(2) The measured result of trouble search is displayed.



(a) AUG#** ... Display the channel under measurement.

(b) ◀□ □▶ ... Place the cursor here and press [Set] to search troubles.

- The channel where a trouble occurred blinks when using ◀□ or □▶ to search troubles.
- The buzzer sounds when no trouble occurs in channels in the search direction.

(c) □ Analyze ...Place the cursor here and press [Set] to open the Analyze: Trouble search screen and to display the details of error and alarm information after the measurement when a trouble occurred in a AUG.

(d) [Trouble search result] ... Trouble search result is displayed after the measurement. "Trouble" is displayed when a trouble occurred at any channel.

(e) Displays the number of channels where troubles are searched and troubles occurred.

(f) (AU4) ... Red light is turned on when an error or an alarm other than LOS, LOF, and AIS occurred at Section/HP (AU).

(g) [Measurement result display area (surrounded by a chain double-dashed line)] ... Measured results of all channels are displayed (the display style varies by the selected mapping route).

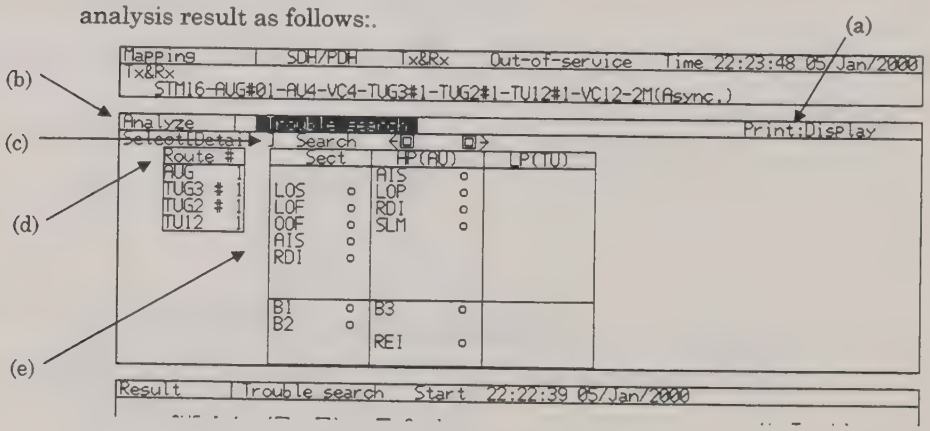
☐ (White light) ... Indicates no trouble occurred.

■ (Red light) ... Indicates a trouble occurred.

- Steps (b) to (d) can be operated after the measurement completion.

Analysis of Search Result *Analyze : Trouble search screen*

Display the Analyze: Trouble search screen to display the search analysis result as follows:.



(a) Print ... Select the content to print (press Print Now to print it).

Display ... The trouble occurred in the route currently displayed.

After ... The trouble occurred after the route currently displayed.

Before ... The trouble occurred before the route currently displayed.

All ... The troubles of all the routes

(b) Select ... Set "Detail" as default to analyze troubles by measured route.

(c) Search ... Routes are searched where a trouble occurred.

...Routes are searched and displayed for a trouble occurred earlier than the displayed route.

...Routes are searched and displayed for a trouble occurred later than the displayed route.

(d) Route # ... The displayed route of channel at each level is displayed.

- Place the cursor on the numeric figure and press Set to open the numeric value entry window. Change the channel to switch the displayed route.

(e) Trouble contents ... Trouble contents in the current route are displayed.

○ (White light) ... Indicates no trouble occurred.

◉ (Red light) ... Indicates a trouble occurred.

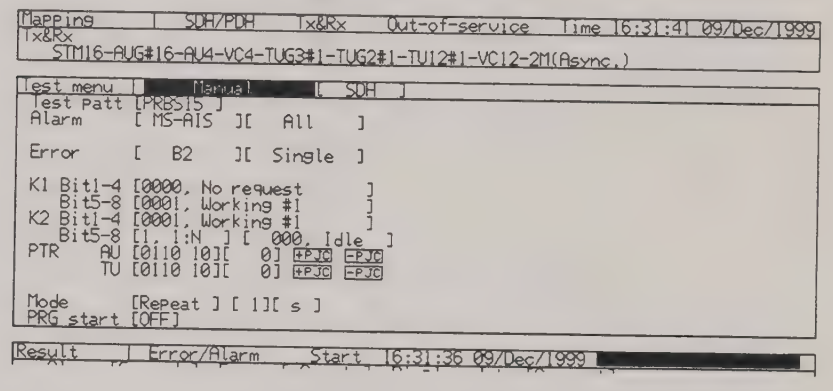
4.2.4 Manual Measurement

Manual measurement enables error or alarm testing, performance measurement, and justification measurement for one channel.

Starting the Setting and the Measurement *Test menu : Manual screen*

(1) Display Test menu: Manual.

(2) Set the screen parameters.


Mapping [SDH/PDH Tx&Rx Out-of-service Time 16:31:4] 09/Dec/1999
Tx&Rx
STM16-AUG#16-AU4-VC4-TUG3#1-TUG2#1-TU12#1-VC12-2M(Async.)
Test menu [Manual [SDH]
Test Patt [PRBS15]
Alarm [MS-AIS][All]
Error [B2][Single]
K1 Bit1-4 [0000, No request]
Bit5-8 [0001, Working #1]
K2 Bit1-4 [0001, Working #1]
Bit5-8 [1, 1:N] [000, Idle]
PTR AU [0110 10][0] +PJC -PJC
TU [0110 10][0] +PJC -PJC
Mode [Repeat] [1][s]
PRG start [OFF]
Result [Error/Alarm Start 16:31:36 09/Dec/1999

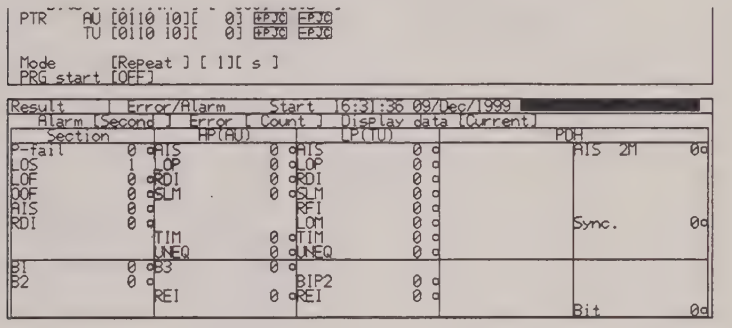
- Select a channel at the top of the mapping screen.
- Set the measurement time in Mode.
- To add an error or an alarm, press [Error] or [Alarm] on the panel.

(3) Measurement results shown in the following pages can be displayed by pressing [Start /Stop] to start the measurement after the above setting.

Display of the Error/Alarm measurement result *Result : Error/Alarm screen*

(1) Display the Result: Error/Alarm screen in the status that the measurement is started after the setting.

(2) A measurement result of error or alarm is displayed.

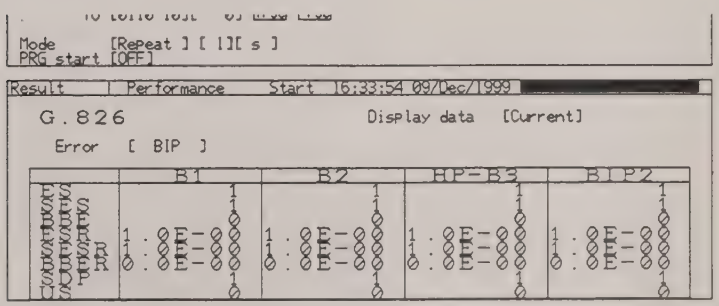

PTR AU [0|1|0 10][0] EPJC EPJC
TU [0|1|0 10][0] EPJC EPJC
Mode [Repeat] [1][s]
PRG start [OFF]
Result | Error/Alarm Start 16:3]:36 09/Dec/1999
Alarm [Second] Error [Count] Display data [Current]
Section
HP(AU)
LP(TU)
POH
P-fail 0 AIS 0 AIS 0
LOS 1 LOP 0 LOP 0
LOF 0 RDI 0 RDI 0
OOF 0 SLM 0 SLM 0
AIS 0 RFI 0
RDI 0 LOM 0 Sync. 0
TIM 0 TIM 0
UNEQ 0 UNEQ 0
B1 0 B3 0
B2 0 BIP2 0
REI 0 REI 0 Bit 0
AIS 2M 0

- The number of errors or the error rate can be selected.
- If current of Display data is selected, the intermediate result during measurement is displayed.

Display of the performance measurement result *Result : Performance screen*

(1) Display the Result: Performance screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The measurement result of performance selected on the Setup: Measurement condition screen is displayed. (For the performance setting, refer to "6.8.3 Setting of Measurement Condition" of the MP1570A Operation Manual Vol. 1.

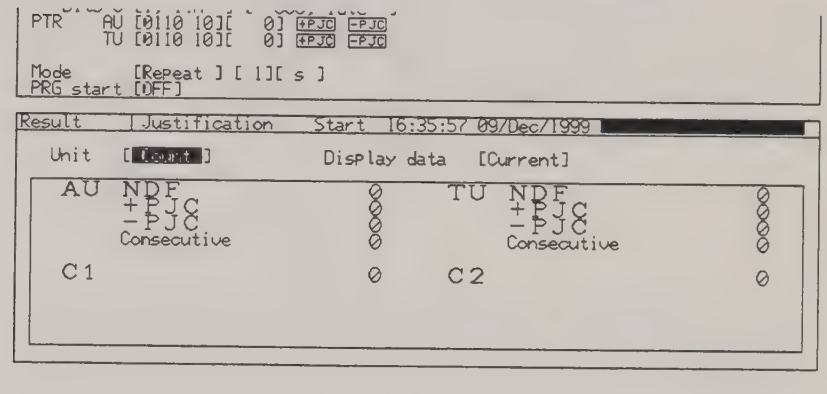


- If "Current" of Display data is selected, the intermediate result during measurement is displayed.

Display of the Justification Measurement Result *Result : Justification screen*

(1) Display the Result: Justification screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The numbers of NDF, + PJC, - PJC, and C-bit Justifications are displayed (when Async. of Mapping is selected).

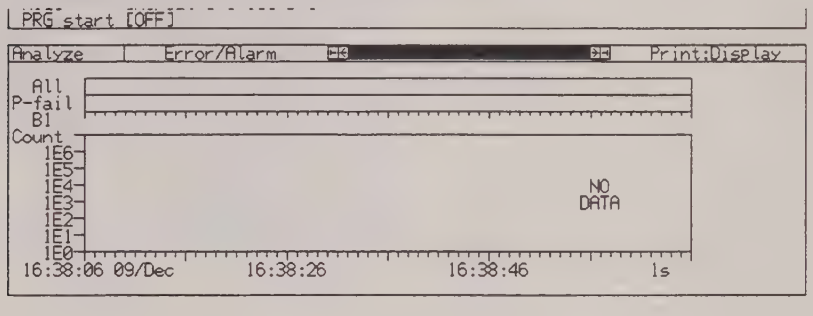


- If current of Display data is selected, the intermediate result during measurement is displayed.

Analysis of the Error/Alarm Measurement Result *Analyze : Error/Alarm screen*

(1) Display the Analyze: Error/Alarm screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The analyzed result of error and alarm is displayed.



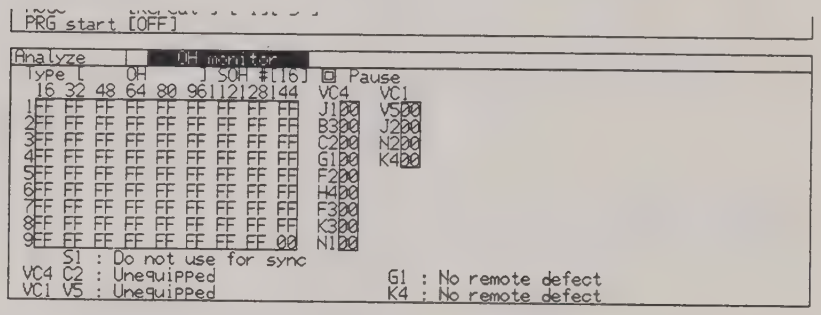
- If single screen display mode, five alarm items and one error item can be displayed at the same time.
- If "ALL" is selected at alarm item, the logical sum of all alarms is displayed.
- If Marker is set to On, detailed data of the searched location is displayed.

Note

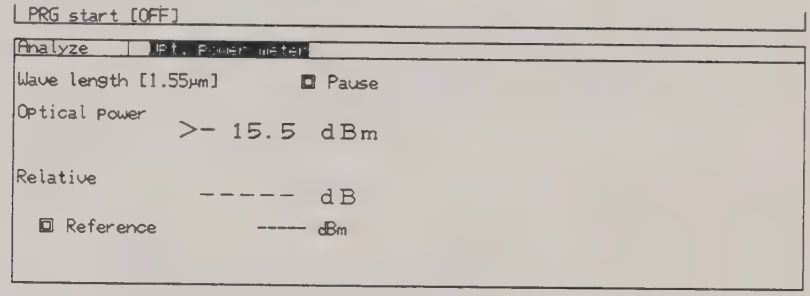
Plotting on the error or alarm graph stops when the memory becomes full.

Other Analysis

If the Analyze: OH Monitor screen is displayed, the K1 byte, K2 byte, AU Pointer, SOH 9 × 9 bytes, and Path trace can be monitored.



If the Analyze: Opt. power meter screen is displayed, the optical power can be monitored.

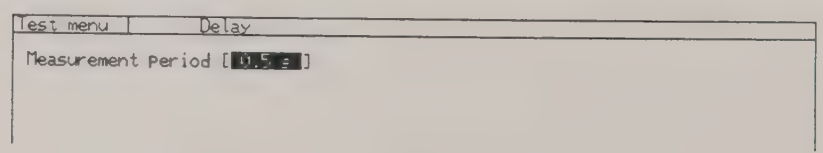


4.2.5 Delay Measurement *Test menu : Delay screen*

The delay of a test signal in the unit under measurement can be measured using the sending and receiving functions of MP1570A. The procedures are as follow:

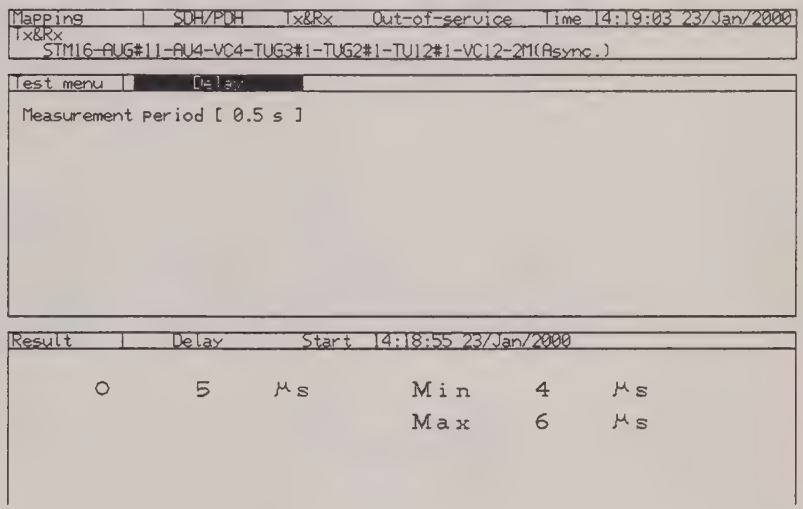
(1) Display the Test menu: Delay screen.

(2) Set the Measurement period.



(3) Press [Start /Stop] to start the measurement.

(4) Maximum and minimum delay values are displayed when the Result: Delay screen is displayed.



Note

- The delay measurement is a time measurement from sending to receiving the signal of MP1570A. Therefore it is recommended to check the continuity before the measurement.
- The delay measurement contains sending and receiving errors separately as shown in the following table:

	Send	Receive
PDH in use	± 1 μ s	± 1 μ s
SDH-VC4 Bulk/139M	± 1 μ s	± 1 μ s
SDH-VC3 Bulk/34M	± 1 μ s	± 1 μ s
SDH-VC12/VC11	±10 μ s	±10 μ s

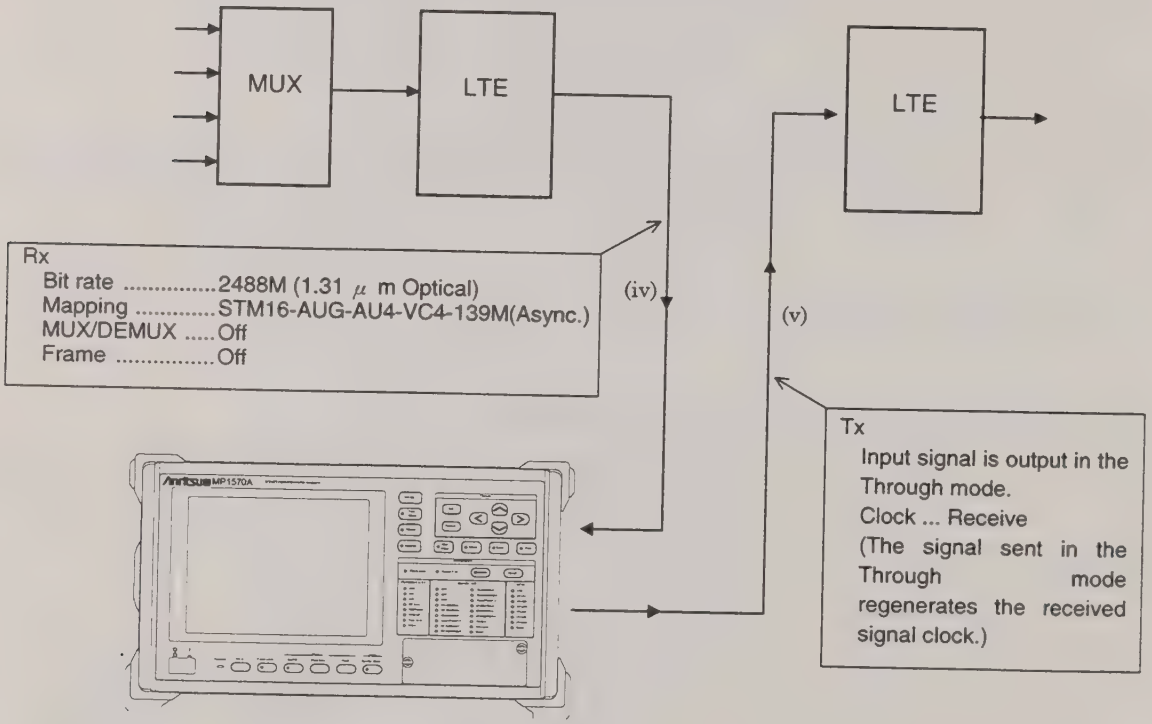
The final error is the sum value of sending and receiving errors. For example, the 2M of PDH sends a signal and the VC12-2M of SDH receives it, the final error becomes ±11 μ s because of the ±1 μ s error generated by sending and the ±10 μ s error generated by receiving. In addition, about 120 μ s error may be generated when using the MUX/DEMUX function and measuring at 64 k×N.

4.3 2488M Through Mode

This section describes the method to monitor the STM16-AUG-AU4-VC4-1395M (Async.) signals in the Through mode as shown below.

4.3.1 Connection of Measurement System

Connect the LTE output branched by the coupler to MP1570A by referring to the following figure:



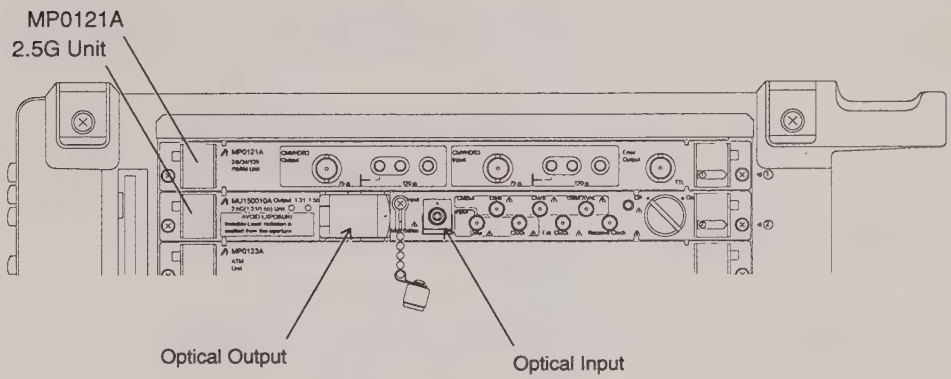
(i) Turn off the power switch of MP1570A.

(ii) Install MP0121A to MP1570A.

(iii) Install the 2.5G unit (MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, or MU150010A) to MP1570A.

(iv) Connect the LTE output to the Optical Input connector of 2.5G unit.

(v) Connect the Optical Output connector of 2.5G unit to the LTE input.



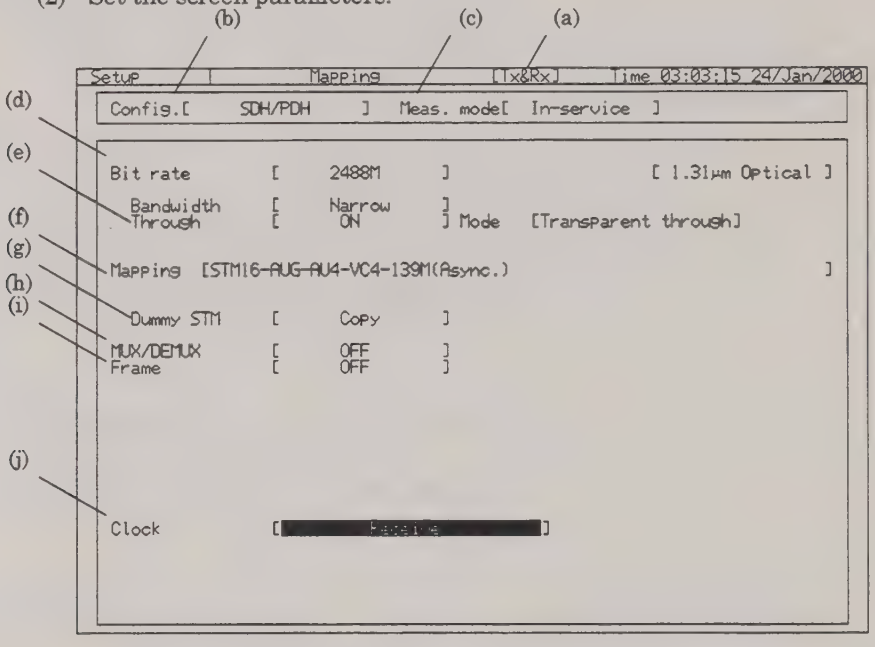
(vi) Turn On the power switch of MP1570A after the connection from (iii) to (v).

4.3.2 Basic Setting *Setup : Mapping screen*

The basic setting is shown to start the measurement in the measurement system described in the previous page.

(1) Display the Setup: Mapping screen.

(2) Set the screen parameters.



(a) [Operation mode] ... Set the TX and RX mode to "Tx&Rx".

(b) Config. ... Set the configuration to "SDH/PDH".

(c) Meas. mode ... Set the measurement mode to "In-service".

(d) Bit rate ... Set the bit rate to "2488M".

(e) Through ... Set the Through mode to "On". In addition, set one in the following modes:

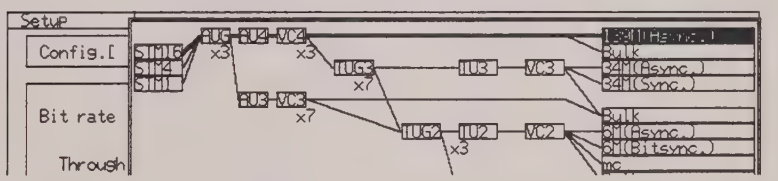
Transparent ... Sends back the received signal as it is.

OH overhead ... Sends the received signal after replacing its overhead to the preset data. For this purpose, select an overhead to edit from "SOH", "POH", "All". For presetting overheads, refer to "6.2 Editing SDH Overhead" of the MP1570A SONET/SDH/PDH/ATM Analyzer Operation Manual Vol. 1.

Payload overwrite .....Sends the received signal after replacing its payload to the test pattern set on the Test menu: Manual screen. For presetting test patterns, refer to "7.2 Manual Measurement" of the MP1570A SONET/SDH/PDH/ATM Analyzer Operation Manual Vol. 1.

(f) Mapping ...Set the mapping to "STM16-AUG-AU4-VC4-139M (Async.)".

- Place the cursor on "Mapping" and press Set to open the mapping selection window. Select the mapping and the route by using ^ v < > and press Set.



(g) Dummy STM ... Set it to "OFF".

(h) MUX/DEMUX ... Set it to "OFF".

(i) Frame ... Set the frame of PDH to "OFF".

(j) Clock ... "Receive" is set when the "Through" mode is set to "ON".

- In case of changing the through mode from "ON" to "OFF", the clock remains in the state of "ON". So that set the clock if necessary.

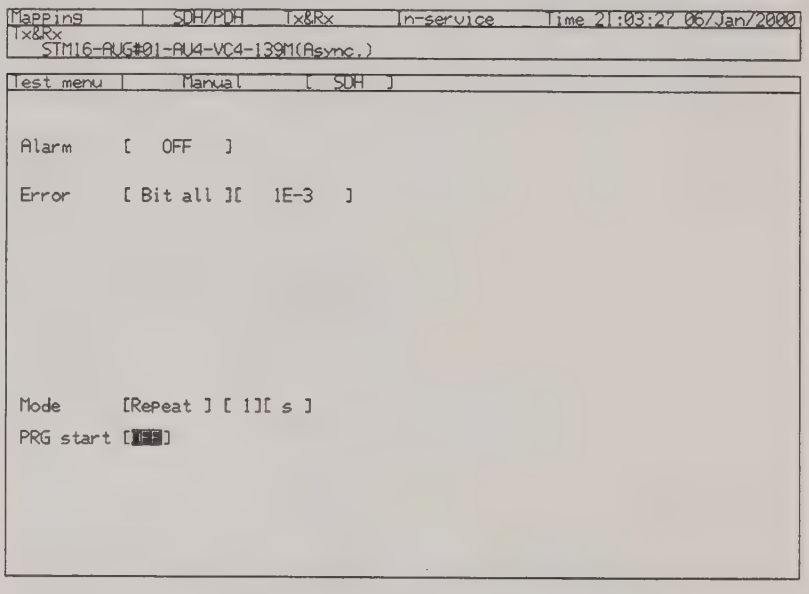
4.3.3 Manual Measurement

Manual measurement enables error or alarm testing, performance measurement, and justification measurement for one channel.

Starting the Setting and the Measurement *Test menu : Manual screen*

(1) Display Test menu: Manual screen.

(2) Set the screen parameters.


Mapping | SDH/PDH Tx&Rx In-service Time 21:03:27 06/Jan/2000
Tx&Rx
STM16-AUG#01-AU4-VC4-139M(Async.)
Test menu | Manual [SDH]
Alarm [OFF]
Error [Bit all][1E-3]
Mode [Repeat] [1][s]
PRG start [OFF]

- Select a channel at the top of the mapping screen.
- Set the measurement time in Mode.
- To add an error or an alarm, press Error or Alarm on the panel.

(3) Measurement results shown in the following pages can be displayed by pressing Start /Stop to start the measurement after the above setting.

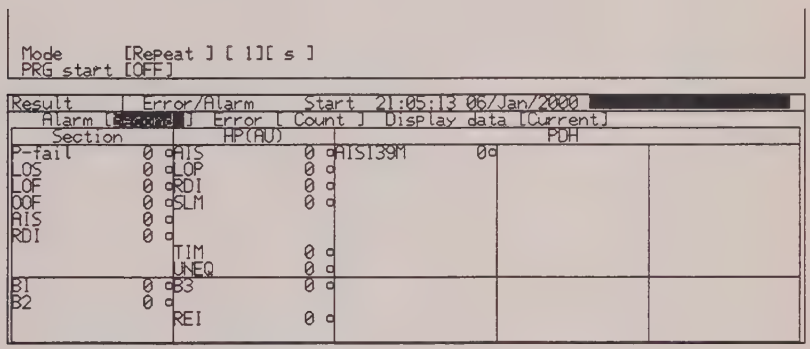
Note

Error and Alarm cannot be added when the MP0127A, MP0128A, or MP0129A is installed.

Display of the Error/Alarm Measurement Result *Result : Error/Alarm screen*

(1) Display the Result: Error/Alarm screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) A measurement result of error or alarm is displayed.

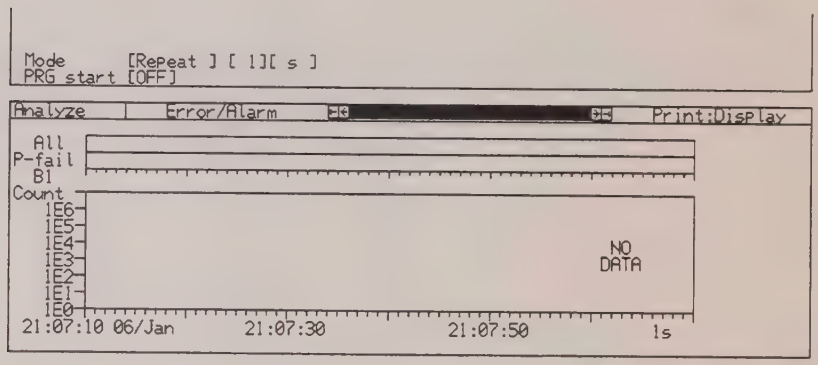


- The number of errors or the error rate can be selected.
- If current of Display data is selected, the intermediate result during measurement is displayed.

Analysis of the Error/Alarm Measurement Result *Analyze : Error/Alarm screen*

(1) Display the Analyze: Error/Alarm screen in the status that the measurement is started after the setting on the Test menu: Manual screen.

(2) The analyzed result of error and alarm is displayed.



- If single screen display mode, five alarm items and one error item can be displayed.
- If "ALL" is selected at alarm item, the logical sum of all alarms is displayed.
- If Marker is set to On, detailed data of the searched location is displayed.

Note

Plotting on the error or alarm graph stops when the memory becomes full.

Section 5 Performance Test

This section describes the procedures to check the waveforms output by the 2.5G, 2.5G/10G, and optical 10G units. Contact Anritsu or our sales representatives when any standard not satisfied in the performance test explained here may imply a failure.

5.1 2.5G Output Waveform (Optical) 5-3
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5.1.2 Test procedures 5-4
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5.3.2 Test procedures 5-8
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5.1 2.5G Output Waveform (Optical)

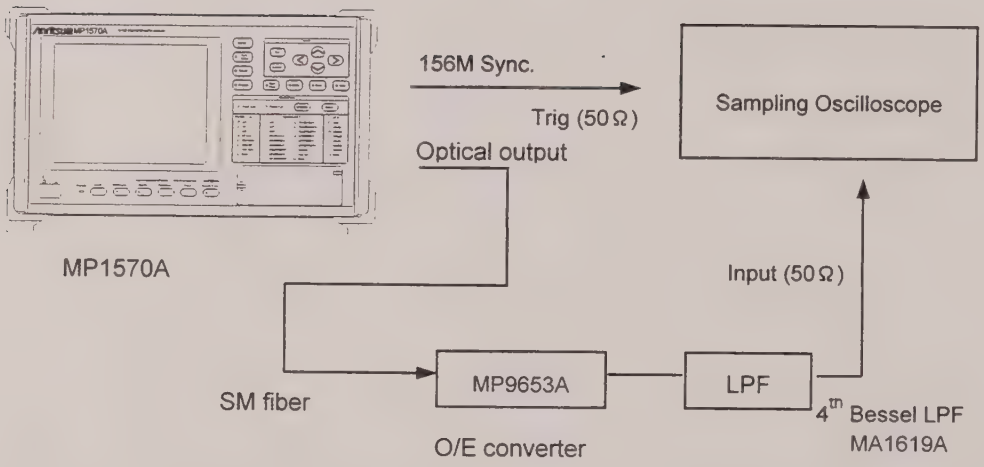
This section describes the procedures to check the optical output waveform of 2.5G for MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A, and MU150001A/B.

5.1.1 Connection

(1) Turn off the power switch of MP1570A.

(2) Connect the above 2.5G or 10G unit to MP1570A.

(3) Connect the O/E converter and the Sampling Oscilloscope as shown in the following figure:



(4) Turn on the power switch of MP1570A after the connection.

5.1.2 Test procedures

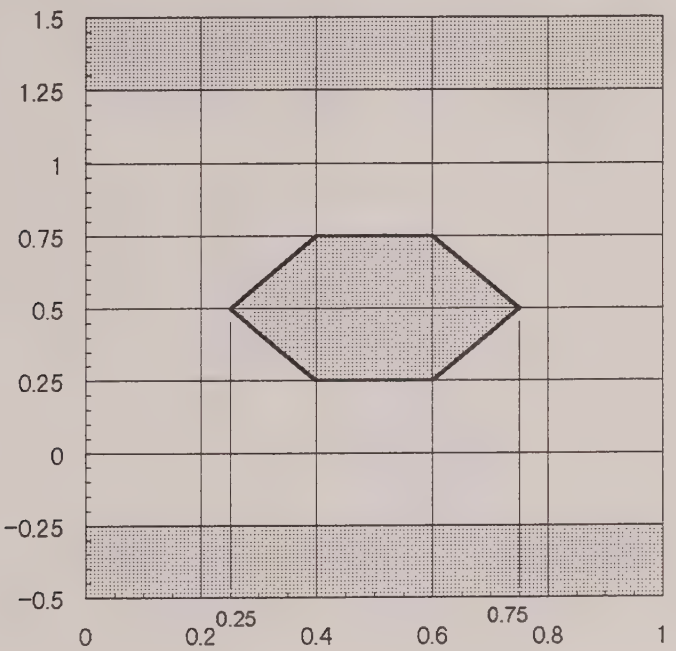
Test the output waveform in the following procedures:

(1) Display the Setup: Mapping screen.

(2) Set the Bit rate to "2488M".

(3) Check whether the waveform displayed on the Sampling Oscilloscope is within the pulse mask shown in the next page.

5.1.3 Pulse mask (2.5G)



5.2 2.5G Output Waveform (Electric)

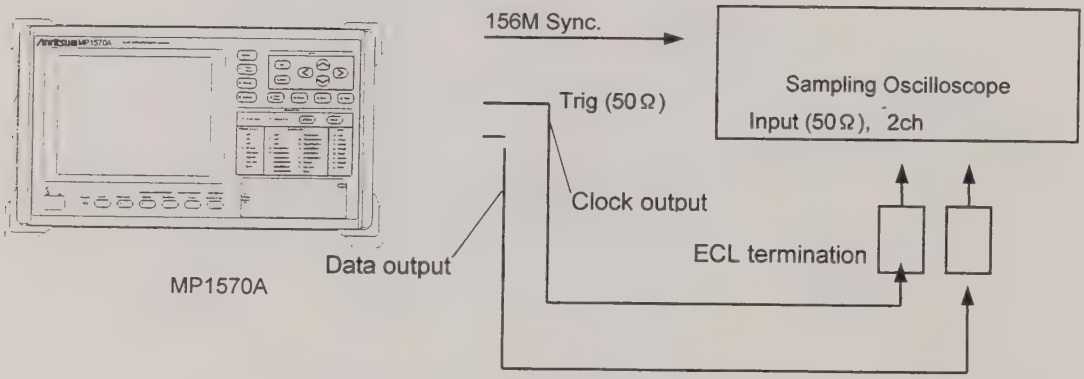
This section describes the procedures to check the 2.5G output waveform of MP0127A, MP0128A, MP0129A, MU150008A, MU150009A, MU150010A, and MU150000A.

5.2.1 Connection

(1) Turn off the power switch of MP1570A.

(2) Connect the above 2.5G unit to MP1570A.

(3) Connect the ECL termination and the Sampling Oscilloscope as shown in the following figure:



- When the MU150000A is tested, the ECL termination is not necessary.

(4) Turn on the power switch of MP1570A after the connection indicated in (3).

5.2.2 Test procedures

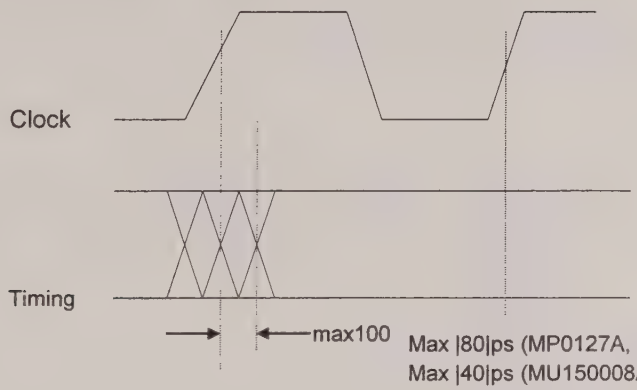
Test the output waveform in the following procedures:

(1) Display the Setup: Mapping screen.

(2) Set the Bit rate to "2488M".

(3) Check whether the waveform displayed on the Sampling Oscilloscope satisfies the following timing:

5.2.3 Timing



Max |80|ps (MP0127A, MP0128A, MP0129A, MU150000A)
Max |40|ps (MU150008A, MU150009A, MU150010A)

5.3 10G Output Waveform (Optical)

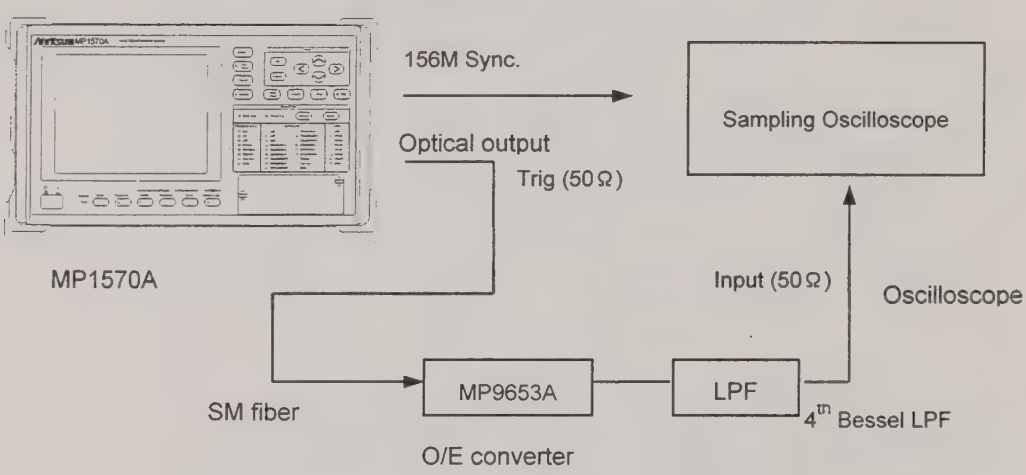
This section describes the procedures to check the 10G optical output waveform of MU150001A/B.

5.3.1 Connection

(1) Turn off the power switch of MP1570A.

(2) Connect MU150000A and MU150001A/B to MP1570A.

(3) Connect the O/E converter and the Sampling Oscilloscope as shown in the following figure:



(4) Turn on the power switch of MP1570A after the connection.

5.3.2 Test procedures

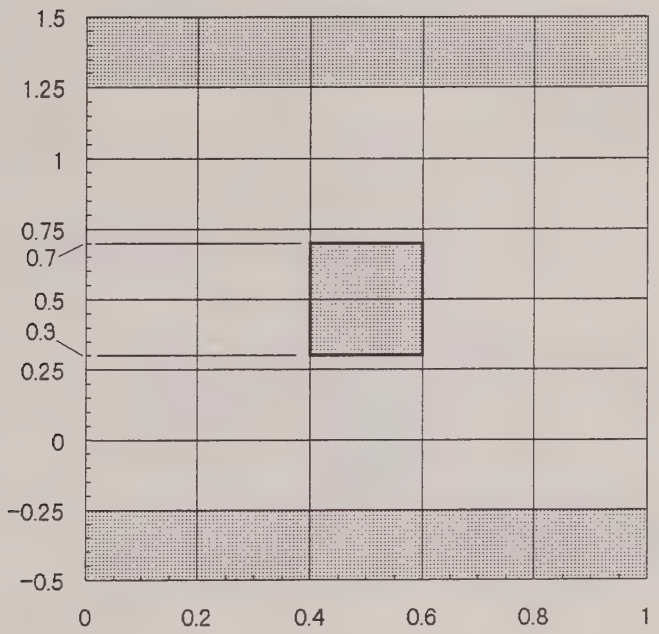
Test the output waveform in the following procedures:

(1) Display the Setup: Mapping screen.

(2) Set the Bit rate to "9953M".

(3) Check whether the waveform displayed on the Sampling Oscilloscope is within the pulse mask shown in the next page.

5.3.3 Pulse mask (10G)



5.4 10G Output Waveform (Electric)

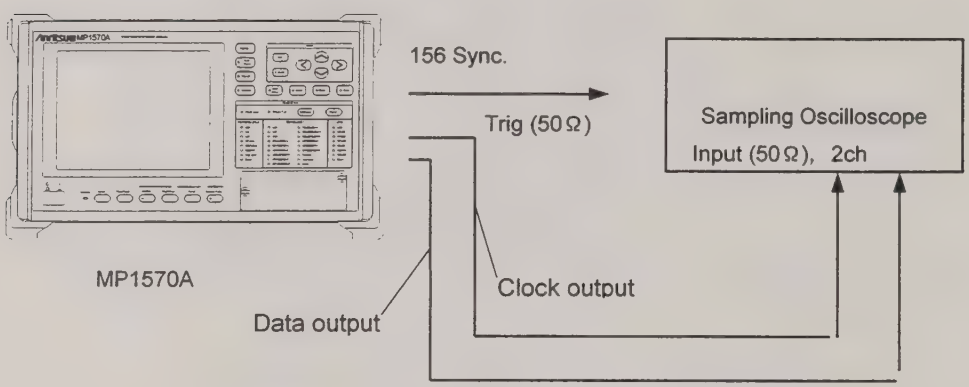
This section describes the procedures to check the 10G output waveform of MU150000A.

5.4.1 Connection

(1) Turn off the power switch of MP1570A.

(2) Connect the above 2.5G unit to MP1570A.

(3) Connect the Sampling Oscilloscope as shown in the following figure:



(4) Turn on the power switch of MP1570A after the connection indicated in (3).

5.4.2 Test procedures

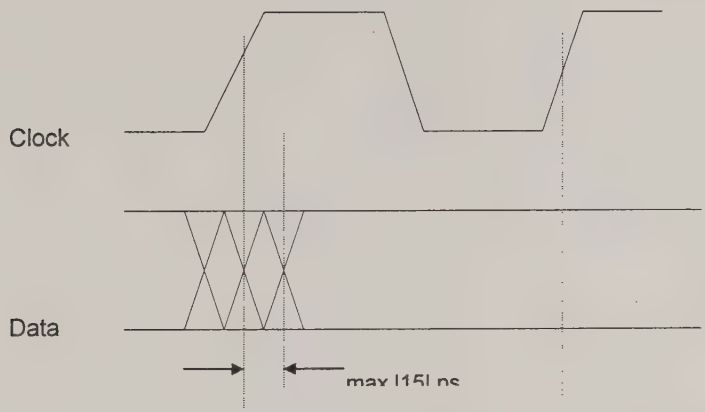
Test the output waveform in the following procedures:

(1) Display the Setup: Mapping screen.

(2) Set the Bit rate to "9953M".

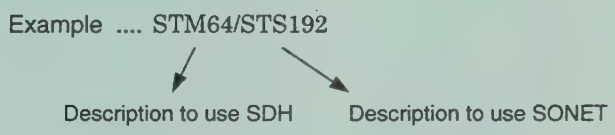
(3) Check whether the waveform displayed on the Sampling Oscilloscope satisfies the following timing:

5.4.3 Timing



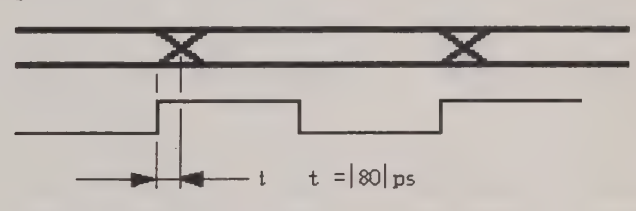
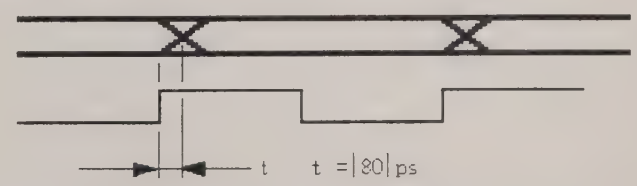
Appendix A Specifications

Specifications of 2.5G, 2.5G/10G, and 10G units are explained. Explanations here to use SDH and SONET are described side-by-side.



A.1 Specifications of the MP0127A 2.5G (1.31) Unit

Item No.	Item	Specification
1	Optical Output	
1.1	Bit rate	2488.32Mbit/s ±100ppm
1.2	Code	NRZ
1.3	Optical source type	DFB-LD(SLM-LD)
1.4	Peak wavelength	1310nm±20nm
1.5	Wavelength width	1nm (Maximum width: - 20 dB)
1.6	Suppression ratio	30 dB or more
1.7	Optical power output	-4dBm±3dB (PN average power)
1.8	Optical output waveform	In accordance with Eye Mask specification using 4th Bessel filter (see "12 Eye Mask".)
1.9	Extinction ratio	10 dB or more
1.10	Connector	FC-PC (Single mode fiber)
2	Optical Input	
2.1	Bit rate	2488.32Mbit ±100ppm
2.2	Code	NRZ
2.3	Receive light wavelength	1310nm
2.4	Level (PN average power)	Narrow : -28～-9dBm(BER 1×10^{-10} or less, +10℃～+30℃) -27～-9dBm(BER 1×10^{-10} or less, 0℃～+40℃)
2.5	Absolute maximum rating	Wide : -20～-9dBm(BER 1×10^{-10} or less, +10℃～+40℃) 0dBm (Peak power)
2.6	Optical input return loss	>= 27dBm (1310nm)
2.7	Connector	FC-PC (Single mode fiber)

Item No.	Item	Specification
3	Electric Output	
3.1	Data	
3.1.1	Bit rate	2488.32Mbit/s 100ppm
3.1.2	Code	NRZ
3.1.3	Level	ECL 0.8V 0.3V_{pp}
3.1.4	Connector	SMA 50 -2V
3.2	Clock	
3.2.1	Frequency	2488.32MHz 100ppm
3.2.2	Level	ECL 0.8V 0.3V_{pp}
3.2.3	Connector	SMA 50 -2V
3.3	Clock/Data phase	Timing 
4	Electric input	
4.1	Data	
4.1.1	Bit rate	2488.32Mbit/s 100ppm
4.1.2	Code	NRZ
4.1.3	Level	ECL
4.1.4	Connector	SMA 50 -2V
4.2	Clock	
4.2.1	Frequency	2488.320MHz 100ppm
4.2.2	Level	ECL
4.2.3	Connector	SMA 50 -2V
4.3	Clock/Data phase	Timing 
5	Monitor Input	
5.1	Bit rate	2488.32Mbit/s 100ppm
5.2	Interface	NRZ
5.3	Level	0.1 1V_{pp}
5.4	Connector	SMA 50

Item No.	Item	Specification
6	External Clock Input	
6.1	Bit rate	2488.32Mbit/s ±100ppm
6.2	Level	$0.8 \pm 0.3 V_{pp}$
6.3	Connector	SMA 50Ω
7	Clock Sync Output	
7.1	Frequency	155.52MHz ±100ppm
7.2	Level	ECL (AC)
7.3	Connector	SMA 50Ω
8	Receive Clock Output	
8.1	Frequency	2488.32MHz ±100ppm
8.2	Level	ECL (AC)
8.3	Connector	SMA 50Ω

Item No.	Item	Specification
9	Optical functions	
9.1	Transmission bandwidth selection	Selection of Wide or Narrow
9.2	Optical input power measurement	
9.2.1	Measurement rage	- 30 to - 9 dBm (1310 nm, peak power)
9.2.2	Absolute accuracy	± 2 dB or less (at - 20 dBm, 1310 nm)
9.2.3	Linearity	± 2 dB or less (at - 30 to - 9 dBm, 1310 nm)
9.3	Optical output control	The key switch is used to control the emission of an optical output.
9.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
9.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation powe When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
9.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 9.3 and 9.4 is performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
9.7	Laser safety standard	21 CFR1040.10 : CLASS Ⅲb IEC 825-1 : CLASS 3A
9.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
10	Electrical functions	
10.1	Mapping	「See "1.5 Mapping Route Measurable When Installing the 2.5G Unit".
10.2	Through	Passes the received 2.5G signal to the transmitter section, as is.
10.3	Error Insertion	FAS, Bit all, B1, B2 (only Bit all for Non-frame Pattern) Timing: Single, IE-3, IE-4, IE-5, IE-6, IE-7, IE-8, IE-9, Burst
10.4	Alarm Addition	LOS, LOF, MS-AIS, MS-RDI (only LOS for Non-frame Pattern) Timing: All
10.5	OH Preset	SOH : #1 SDH: Uses the value set in the #1 main frame. : #2 to #16: Presets all bytes except for B1, H1, H2, H3, and C1. Sets common values for #2 to #16. A value that identifies a channel can be set in C1.
10.6	Error Measurement	B1, B2, Bit (for Non-frame Pattern) Measurement range Error Count : 0～999999, 1.0E06～9.9E15, >9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15
10.7	Alarm Measurement	LOS, LOF, OOF, MS-AIS, MS-RDI, Sync Loss (for Non-frame Pattern)
	Measurement range	Alarm second : 0 - 999999, 1.0E06 - 9.9E15, > 9.9E15

Item No.	Item	Specification
10.8	Performance	Satisfies ITU-T G.826. B1 : EB, ES, SES, BBE, ESR, SESR, BBER, US B2 : EB, ES, SES, BBE, ESR, SESR, BBER, US Measurement range : EB, ES, SES, BBE, US 0～999999, 1.0E06～9.9E15, >9.9E15 (Over flow) ESR, SESR, BBER 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15 (Under flow) Values 0 (EB, ES, SES, BBE, or US) and 1.0E-00 (ESR, SESR, or BBER) are ser during one second after the start of measurement.
10.9	Alarm detection/release conditions	LOS Detection : Optical input loss Release : 2 frames OOF Detection : 4 frames Release : 2 frames MS-AIS Detection : 5 frames of b678 = 111 of K2 Release : 5 frames of bits other than b678 = 111 of K2 Sync. Detection : 10000-bit error in 99968 bits (non-fame) Release : No error in 64-bit succession K1, K2 bytes AU pointer
10.10	Monitor	SOH 9 × 9 bytes Path trace
10.11	Clock	Configuration with MP0121A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 2Mbit/s (Unbalanced) · 2Mbit/s (Balanced) · 1.5MHz (Balanced) · External · Receive Configuration with MP0122A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 1.5MHz (Balanced) · 1.5Mbit/s (Balanced) · External · Receive
10.12	Clock Loss detection	Detects clock loss for External Clock..
10.13	Framed/Unframed	PRB/S2^{23}-1 (Option 02 installed)

Item No.	Item	Specification
11	Jitter	
11.1	Residual jitter	

Bit rate	Range	Additional error (UI_{PP}) * SDH internal signal
2488.32M	2UI	0.110
	32UI	2.2

Filter : HP1+LP

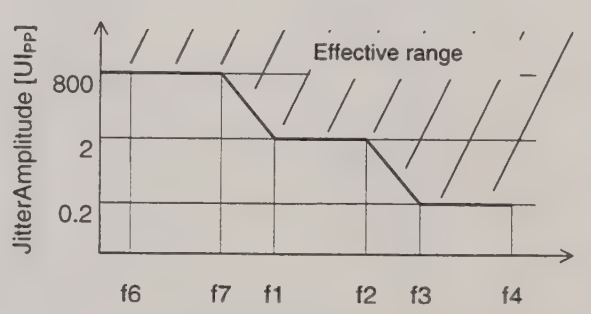
* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

Bit rate	Range	Additional error (UI_{rms}) * SDH internal signal
2488.32M	2UI	0.027
	32UI	0.55

Filter : HP1+LP

* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

11.2 Jitter tolerance

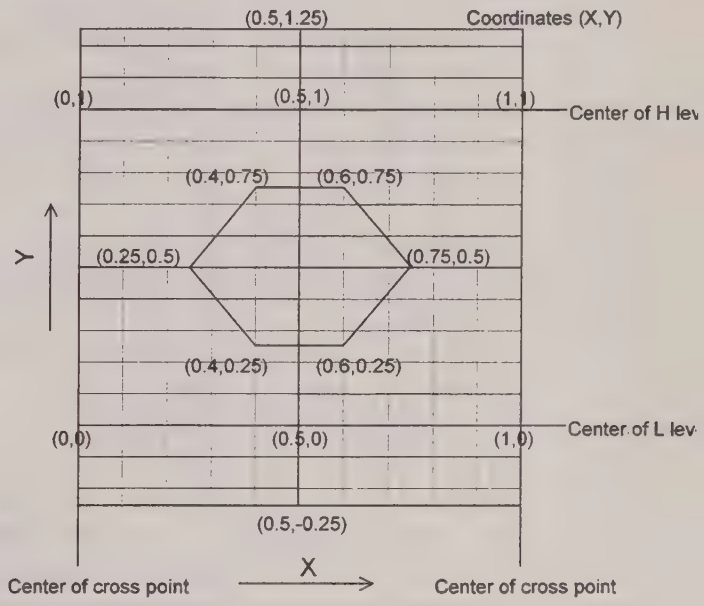


	Jitter frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Measurement condition

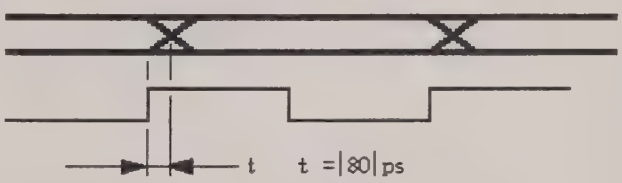
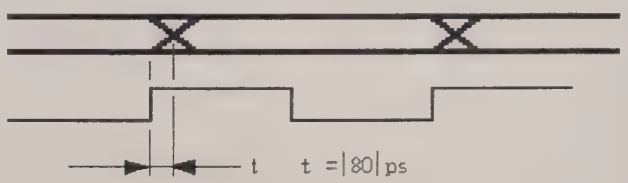
· +10～+40℃

· Input level : -12～-10dBm

Item No.	Item	Specification
12	Eye Mask	Uses the 4th Bessel Thomson filter to evaluate the waveform in accordance with the following Eye Mask specification: <Eye Mask specification> 
13	General	
13.1	Dimensions, mass	21(H)×255(W)×167.6(D)mm (Excluding projections), less than 2 kg
13.2	Operation temperature	0～+40℃
13.3	Storage temperature	-20～+60℃

A.2 Specifications of the MP0128A 2.5G (1.55) Unit

Item No.	Item	Specification
1	Optical Output	
1.1	Bit rate	2488.32Mbit/s ±100ppm
1.2	Code	NRZ
1.3	Optical source type	DFB-LD (SLM-LD) DFB-LD (built-in EA modulation, option 01)
1.4	Peak wavelength	1550nm±20nm
1.5	Wavelength width	1nm (Maximum width: - 20 dB)
1.6	Suppression ratio	30 dB or more
1.7	Optical power output	-4dBm±3dB (PN average power)
1.8	Optical output waveform	In accordance with Eye Mask specification using 4th Bessel filter (see "12 Eye Mask".)
1.9		
1.10	Extinction ratio	10 dB or more
	Connector	FC-PC (Single mode fiber)
2	Optical Input	
2.1	Bit rate	2488.32Mbit/s ±100ppm
2.2	Code	NRZ
2.3	Receive light wavelength	1550nm
2.4	Level (PN average power)	Narrow : -28～-9dBm(BER 1×10^{-10} or less, +10℃～+30℃) -27～-9dBm(BER 1×10^{-10} or less, 0℃～+40℃) Wide : -20～-9dBm(BER 1×10^{-10} or less, +10℃～+40℃)
2.5	Absolute maximum rating	0dBm (Peak power)
2.6	Connector	FC-PC (Single mode fiber)

Item No.	Item	Specification
3	Electric Output	
3.1	Data	
3.1.1	Bit rate	2488.32Mbit/s ±100ppm
3.1.2	Code	NRZ
3.1.3	Level	ECL 0.8V±0.3V_{pp}
3.1.4	Connector	SMA 50Ω -2V
3.2	Clock	
3.2.1	Frequency	2488.320MHz±100ppm
3.2.2	Level	ECL 0.8V±0.3V_{pp}
3.2.3	Connector	SMA 50Ω -2V
3.3	Clock/Data phase	Timing 
4	Electric input	
4.1	Data	
4.1.1	Bit rate	2488.32Mbit/s ±100ppm
4.1.2	Code	NRZ
4.1.3	Level	ECL
4.1.4	Connector	SMA 50Ω -2V
4.2	Clock	
4.2.1	Frequency	2488.32MHz±100ppm
4.2.2	Level	ECL
4.2.3	Connector	SMA 50Ω -2V
4.3	Clock/Data phase	Timing 
5	Monitor Input	
5.1	Bit rate	2488.32Mbit/s ±100ppm
5.2	Interface	NRZ
5.3	Level	0.1~1V_{pp}
5.4	Connector	SMA 50Ω

Item No.	Item	Specification
6	External Clock Input	
6.1	Bit rate	2488.32Mbit/s ±100ppm
6.2	Level	$0.8 \pm 0.3 V_{pp}$
6.3	Connector	SMA 50Ω
7	Clock Sync Output	
7.1	Frequency	155.52MHz ±100ppm
7.2	Level	ECL (AC)
7.3	Connector	SMA 50Ω
8	Receive Clock Output	
8.1	Frequency	2488.32MHz ±100ppm
8.2	Level	ECL (AC)
8.3	Connector	SMA 50Ω

Item No.	Item	Specification
9	Optical functions	
9.1	Transmission bandwidth selection	Selection of Wide or Narrow
9.2	Optical input power measurement	-
9.2.1	Measurement rage	- 30 to - 9 dBm (1550 nm, peak power)
9.2.2	Absolute accuracy	± 2 dB or less (at - 20 dBm, 1550 nm)
9.2.3	Linearity	± 2 dB or less (at - 30 to - 9 dBm, 1550 nm)
9.3	Optical output control	The key switch is used to control the emission of an optical output.
9.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
9.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation power When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
9.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 9.3 and 9.4 is performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
9.7	Laser safety standard	21 CFR1040.10 : CLASS Ⅲb IEC 825-1 : CLASS 3A
9.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
10	Electrical functions	
10.1	Mapping	「See "1.5 Mapping Route Measurable When Installing the 2.5G Unit".
10.2	Through	Passes the received 2.5G signal to the transmitter section, as is.
10.3	Error Insertion	FAS, Bit all, B1, B2 (only Bit all for Non-frame Pattern)
10.4		Timing: Single, IE-3, IE-4, IE-5, IE-6, IE-7, IE-8, IE-9, Burst
10.5	Alarm Addition	LOS, LOF, MS-AIS, MS-RDI (only LOS for Non-frame Pattern) Timing: All
10.5	OH Preset	SOH : #1 SDH: Uses the value set in the #1 main frame. : #2 to #16: Presets all bytes except for B1, H1, H2, H3, and C1. Sets common values for #2 to #16. A value that identifies a channel can be set in C1.
10.6	Error Measurement	B1, B2, Bit (for Non-frame Pattern) Measurement range Error Count : 0～999999, 1.0E06～9.9E15, >9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15
10.7	Alarm Measurement Measurement range	LOS, LOF, OOF, MS-AIS, Sync Loss (for Non-frame Pattern) Alarm second : 0 - 999999, 1.0E06 - 9.9E15, > 9.9E15

Item No.	Item	Specification
10.8	Performance	Satisfies ITU-T G.826. B1 : EB, ES, SES, BBE, ESR, SESR, BBER, US B2 : EB, ES, SES, BBE, ESR, SESR, BBER, US Measurement range : EB, ES, SES, BBE, US 0～999999, 1.0E06～9.9E15, >9.9E15 (Over flow) ESR, SESR, BBER 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15 (Under flow) Values 0 (EB, ES, SES, BBE, or US) and 1.0E-00 (ESR, SESR, or BBER) are ser during one second after the start of measurement.
10.9	Alarm detection/release conditions	LOS Detection : Optical input loss Release : 2 frames OOF Detection : 4 frames Release : 2 frames MS-AIS Detection : 5 frames of b678 = 111 of K2 Release : 5 frames of bits other than b678 = 111 of K2 Sync. Detection : 10000-bit error in 99968 bits (non-frame) Release : No error in 64-bit succession K1, K2 bytes AU pointer
10.10	Monitor	SOH 9 × 9 bytes Path trace Configuration with MP0121A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 2Mbit/s (Unbalanced) · 2Mbit/s (Balanced) · 1.5MHz (Balanced) · External · Receive Configuration with MP0122A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 1.5MHz (Balanced) · 1.5Mbit/s (Balanced) · External · Receive
10.11	Clock	
10.12	Clock Loss detection	Detects clock loss for External Clock.
10.13	Framed/Unframed	PRB/S2^{23}-1 (Option 02 installed)

Item No.	Item	Specification
11	Jitter	
11.1	Residual jitter	

Bit rate	Range	Additional error (UI_{PP}) * SDH internal signal
2488.32M	2UI	0.110
	32UI	2.2

Filter : HP1+LP

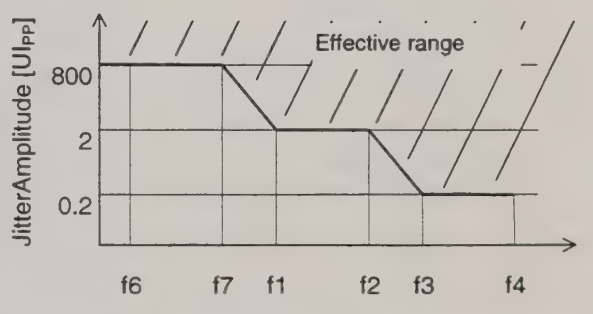
* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

Bit rate	Range	Additional error (UI_{rms}) * SDH internal signal
2488.32M	2UI	0.027
	32UI	0.55

Filter : HP1+LP

* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

11.2 Jitter tolerance

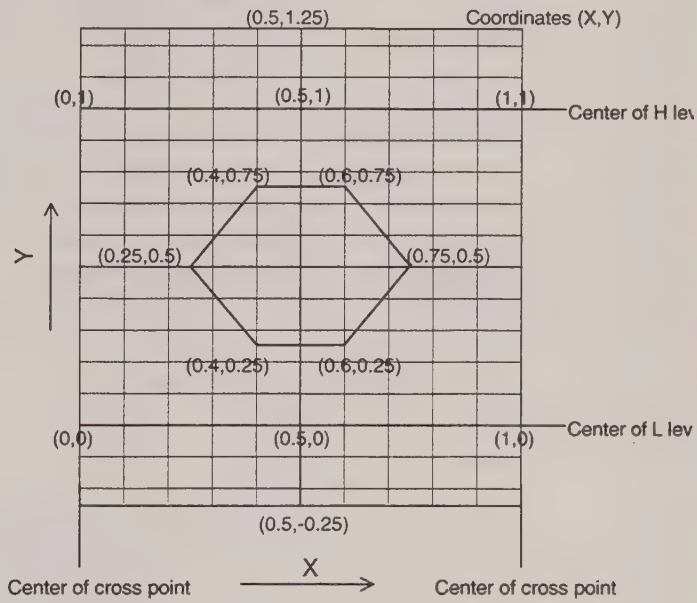


	Jitter frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Measurement condition

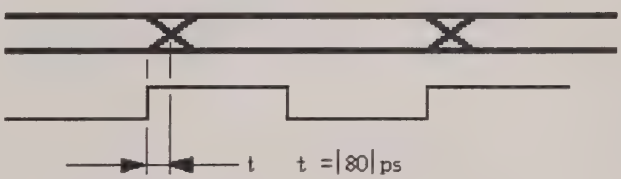
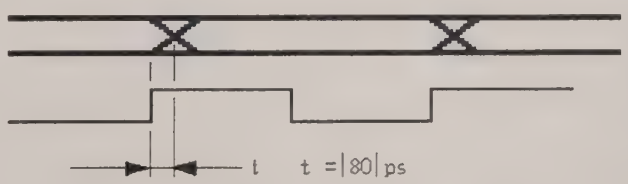
· +10～+40℃

· Input level : -12～-10dBm

Item No.	Item	Specification
12	Eye Mask	Uses the 4th Bessel Thomson filter to evaluate the waveform in accordance with the following Eye Mask specification: <Eye Mask specification> 
13	General	
13.1	Dimensions, mass	21(H)×255(W)×167.6(D)mm (Excluding projections), less than 2 kg
13.2	Operation temperature	0～+40℃
13.3	Storage temperature	-20～+60℃

A.3 Specifications of the MP0129A 2.5G (1.31/1.55) Unit

Item No.	Item	Specification
1	Optical Output	
1.1	Bit rate	2488.32Mbit/s ±100ppm
1.2	Code	NRZ
1.3	Optical source type	1310nm band : DFB-LD (SLM-LD) 1550nm band : DFB-LD (SLM-LD) 1550nm band : DFB-LD (built-in EA modulation, option 01)
1.4	Peak wavelength	1310nm±20nm 1550nm±20nm
1.5	Wavelength width	1nm (Maximum width: - 20 dB)
1.6	Suppression ratio	30 dB or more
1.7	Optical power output	-4dBm±3dB (PN average power)
1.8	Optical output waveform	In accordance with Eye Mask specification using 4th Bessel filter (see "12 Eye Mask".)
1.9	Extinction ratio	10 dB or more
1.10	Connector	FC-PC (Single mode fiber)
2	Optical Input	
2.1	Bit rate	2488.32Mbit/s
2.2	Code	NRZ
2.3	Receive light wavelength	1310 and 1550 nm
2.4	Level (PN average power	Narrow : -28～-9dBm(BER 1×10^{-10} or less, +10℃～+30℃) -27～-9dBm(BER 1×10^{-10} or less, 0℃～+40℃) Wide : -20～-9dBm(BER 1×10^{-10} or less, +10℃～+40℃)
2.5	Absolute maximum Rating	0dBm (Peak power)
2.6	Optical input return loss	>= 27dB
2.7	Connector	FC-PC (Single mode fiber)

Item No.	Item	Specification
3	Electric Output	
3.1	Data	
3.1.1	Bit rate	2488.32Mbit/s ±100ppm
3.1.2	Code	NRZ
3.1.3	Level	ECL 0.8V±0.3V_{pp}
3.1.4	Connector	SMA 50Ω -2V
3.2	Clock	
3.2.1	Frequency	2488.32MHz ±100ppm
3.2.2	Level	ECL 0.8V±0.3V_{pp}
3.2.3	Connector	SMA 50Ω -2V
3.3	Clock/Data phase	Timing 
4	Electric input	
4.1	Data	
4.1.1	Bit rate	2488.32Mbit/s ±100ppm
4.1.2	Code	NRZ
4.1.3	Level	ECL
4.1.4	Connector	SMA 50Ω -2V
4.2	Clock	
4.2.1	Frequency	2488.32MHz±100ppm
4.2.2	Level	ECL
4.2.3	Connector	SMA 50Ω -2V
4.3	Clock/Data phase	Timing 
5	Monitor Input	
5.1	Bit rate	2488.32Mbit/s ±100ppm
5.2	Interface	NRZ
5.3	Level	0.1～1V_{pp}
5.4	Connector	SMA 50Ω

Item No.	Item	Specification
6	External Clock Input	
6.1	Bit rate	2488.32Mbit/s ±100ppm
6.2	Level	$0.8 \pm 0.3 V_{pp}$
6.3	Connector	SMA 50Ω
7	Clock Sync Output	
7.1	Frequency	155.52MHz ±100ppm
7.2	Level	ECL (AC)
7.3	Connector	SMA 50Ω
8	Receive Clock Output	
8.1	Frequency	2488.32MHz ±100ppm
8.2	Level	ECL (AC)
8.3	Connector	SMA 50Ω

Item No.	Item	Specification
9	Optical functions	
9.1	Transmission bandwidth selection	Selection of Wide or Narrow
9.2	Optical input power measurement	-
9.2.1	Measurement rage	- 30 to - 9 dBm (1310/1550 nm, peak power)
9.2.2	Absolute accuracy	± 1 dB or less (at - 20 dBm, 1310/1550 nm)
9.2.3	Linearity	± 1 dB or less (at - 30 to - 9 dBm, 1330/1550 nm)
9.3	Optical output control	The key switch is used to control the emission of an optical output.
9.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
9.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation power When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
9.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 9.3.1, 9.3.2, or 9.3.3 is performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
9.7	Laser safety standard	21 CFR1040.10 : CLASSⅢb IEC 825-1 : CLASS 3A
9.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
10	Electrical functions	
10.1	Mapping	「See "1.5 Mapping Route Measurable When Installing the 2.5G Unit".
10.2	Through	Passes the received 2.5G signal to the transmitter section, as is.
10.3	Error Insertion	FAS, Bit all, B1, B2 (only Bit all for Non-frame Pattern)
10.4		Timing: Single, IE-3, IE-4, IE-5, IE-6, IE-7, IE-8, IE-9
10.5	Alarm Addition	LOS, LOF, MS-AIS, MS-RDI (only LOS for Non-frame Pattern) Timing: All
10.5	OH Preset	SOH : #1 SDH: Uses the value set in the #1 main frame. : #2 to #16: Presets all bytes except for B1, H1, H2, H3, and C1. Sets common values for #2 to #16. A value that identifies a channel can be set in C1.
10.6	Error Measurement	B1, B2, Bit (for Non-frame Pattern) Measurement range Error Count : 0～999999, 1.0E06～9.9E15, >9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15
10.7	Alarm Measurement Measurement range	LOS, LOF, OOF, MS-AIS, Sync Loss (for Non-frame Pattern) Alarm seconds : 0 - 999999, 1.0E06 - 9.9E15, > 9.9 E15

Item No.	Item	Specification
10.8	Performance	Satisfies ITU-T G.826. B1 : EB, ES, SES, BBE, ESR, SESR, BBER, US B2 : EB, ES, SES, BBE, ESR, SESR, BBER, US Measurement range : EB, ES, SES, BBE, US 0～999999, 1.0E06～9.9E15, >9.9E15 (Over flow) ESR, SESR, BBER 1.0E-15～9.9E-01, 1.0E-00, <1.0E-15 (Under flow) Values 0 (EB, ES, SES, BBE, or US) and 1.0E-00 (ESR, SESR, or BBER) are ser during one second after the start of measurement.
10.9	Alarm detection/release conditions	LOS Detection : Optical input loss Release : 2 frames OOF Detection : 4 frames Release : 2 frames MS-AIS Detection : 5 frames of b678 = 111 of K2 Release : 5 frames of bits other than b678 = 111 of K2 Sync. Detection : 10000-bit error in 99968 bits (non-frame) Release : No error in 64-bit succession
10.10	Monitor	K1, K2 bytes AU pointer SOH 9 × 9 bytes Path trace
10.11	Clock	Configuration with MP0121A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 2Mbit/s (Unbalanced) · 2Mbit/s (Balanced) · 1.5MHz (Balanced) · External · Receive Configuration with MP0122A · Internal · 2MHz (Unbalanced) · 2MHz (Balanced) · 1.5MHz (Balanced) · 1.5Mbit/s (Balanced) · External · Receive
10.12	Clock Loss detection	Detects clock loss for External Clock.
10.13	Framed/Unframed	PRB/S2^{23}-1 (Option 02 installed)

Item No.	Item	Specification
11	Jitter	
11.1	Residual jitter	

Bit rate	Range	Additional error (UI_{PP}) * SDH internal signal
2488.32M	2UI	0.110
	32UI	2.2

Filter : HP1+LP

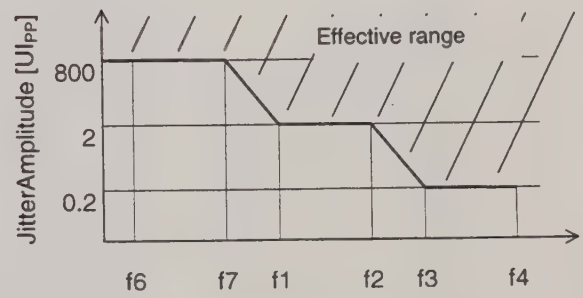
* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

Bit rate	Range	Additional error (UI_{rms}) * SDH internal signal
2488.32M	2UI	0.027
	32UI	0.55

Filter : HP1+LP

* SDH internal signal: VC4 mapping, Info : PRBIT/S2^{23}-1, Scramble "ON", + 10 ° C to + 40 ° C at input level - 12 to – 10 dBm. Additional 0.01 UIpp/dB with input level < - 12 dBm

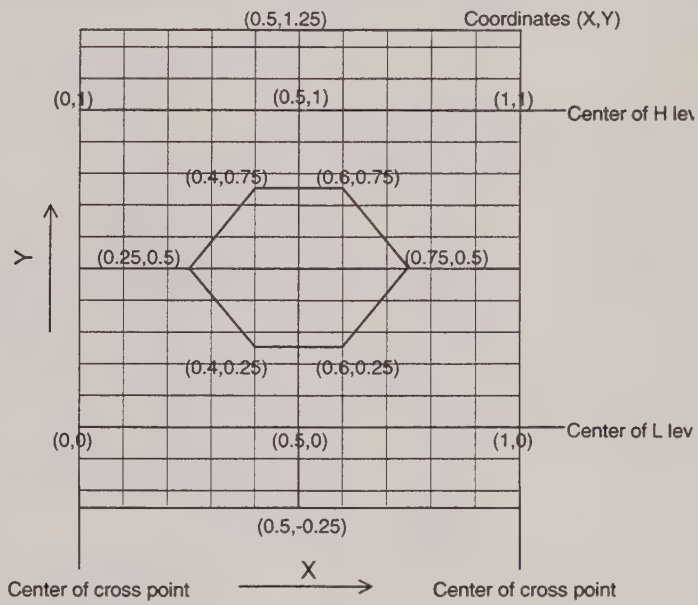
11.2 Jitter tolerance



	Jitter frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Measurement condition

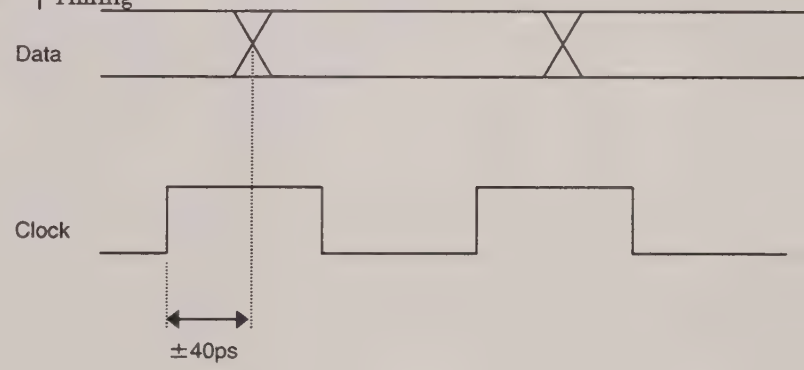
- +10～+40℃
- Input level : -12～-10dBm

Item No.	Item	Specification
12	Eye Mask	Uses the 4th Bessel Thomson filter to evaluate the waveform in accordance with the following Eye Mask specification: <Eye Mask specification> 
13	General	
13.1	Dimensions, mass	21(H)×255(W)×167.6(D)mm (Excluding projections), less than 2 kg
13.2	Operation temperature	0～+40℃
13.3	Storage temperature	-20～+60℃

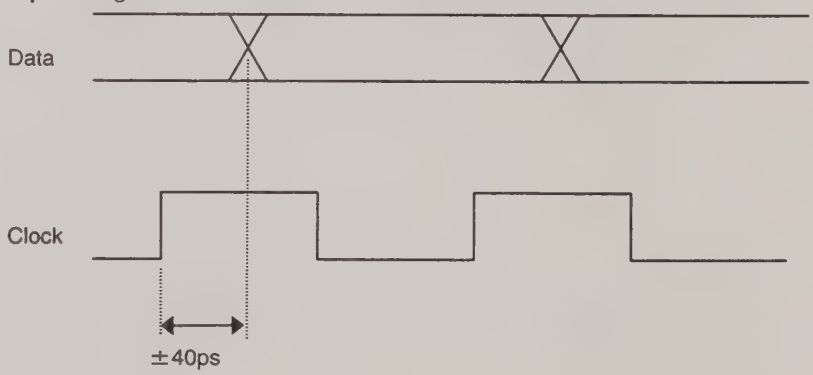
A.4 Specifications of the MU150008A 2.5G(1.31) Unit

Item No.	Item	Specification
1	Optical input signal	
1.1	Bit rate	2488.320Mbit/s±100ppm
1.2	Input signal code	NRZ
1.3	Receive optical wavelength band	1310nm band
1.4	Optical input level (PN average power)	Narrow:-27～-9dBm(BER 1×10^{-10}or less, at 0 - 30℃) Wide :-20～-9dBm(BER 1×10^{-10}or less,10 - 40℃)
1.5	Absolute Maximum input power	0 dBm(peak power)
1.6	Optical Input return loss	27dB or more
1.7	Connector	FC-PC(SMF)
2	Optical output signal	
2.1	Bit rate	2488.32Mbit/s±100ppm
2.2	Optical source type	1310nm band optical source : DFB-LD
2.3	Peak wavelength	1310nm band optical source : 1310nm±20nm
2.4	Wavelength width	1.0nm max. (Full width at -20dB)
2.5	Side mode suppression ratio	30dB or more
2.6	Optical output power	-4dBm±3dB (PN average power)
2.7	Output signal code	NRZ
2.8	Optical output wave form	In accordance with Eye mask specification using 4th Bessel LPF(see Item No .9)
2.9	Extinction ratio	10dB or more
2.10	Connector	FC-PC(SMF)

Item No.	Item	Specification
3	Electric input signal	
	Data input	
3.1	Bit rate	2488.320Mbit/s±100ppm
3.2	Input signal level	
	Data input mode	ECL
	Monitor input mode	0.1～1V(p-p)
3.3	Input signal code	NRZ
3.4	Impedance	
	Data input mode	50Ω / -2V termination
	Monitor input mode	50Ω AC
3.5	Connector	SMA
	Clock input	
3.6	Frequency	2488.320MHz±100ppm
3.7	Input signal level	ECL(50Ω / -2V termination)
3.8	Clock/Data phase	Timing
3.9	Connector	SMA



Item No.	Item	Specification
4	External clock input	
4.1	Frequency	2488.320MHz±100ppm
4.2	Impedance	50Ω AC
4.3	Connector	SMA
5	Electric output signal	
	Data output	
5.1	Bit rate	2488.320MHz±100ppm
5.2	Output signal level	ECL
5.3	Output signal code	NRZ
5.4	Impedance	50Ω / -2V termination
5.5	Connector	SMA
	Clock output	
5.6	Frequency	2488.320MHz±100ppm
5.7	Output signal level	ECL
5.8	Clock/Data phase	Timing
5.9	Impedance	50Ω / -2V termination
5.10	Connector	SMA
6	Clock sync. output	
6.1	Frequency	155.520MHz±100ppm
6.2	Output signal level	ECL (50Ω AC)
6.3	Connector	SMA



Item No.	Item	Specification
7	Receive clock output	
7.1	Frequency	2488.320MHz±100ppm
7.2	Output signal level	ECL (AC)
7.3	Connector	SMA
8	Optical functions	
8.1	Transmission bandwidth selection	Selection of Wide or Narrow
8.2	Optical input power measurement	-
8.2.1	Measurement rage	- 30 to - 9 dBm (1310 nm, peak power)
8.2.2	Absolute accuracy	± 1 dB or less (at - 20 dBm, 1310 nm)
8.2.3	Linearity	± 1 dB or less (at - 30 to - 9 dBm, 1310 nm)
8.3	Optical output control	The key switch is used to control the emission of an optical output.
8.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
8.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation power When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
8.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 8.3 and 8.4 are performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
8.7	Laser safety standard	21 CFR1040.10 : CLASSⅢb IEC 825-1 : CLASS 3A
8.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
9	Electric functions)	
9.1	Mapping	See "1.5 Mapping Route Measurable When Installing the
9.2	Concatenation mapping	2.5G Unit".
9.3	Through mode	Only when Tx&Rx mode
	Bit rate	2488.320Mbit/s
	Mode	Transparent through, OH overwrite, Payload overwrite, add/drop
9.4	Insert/Extract mode	Inserts the payloads of STM-n (n=0 - 4) signals inputted from external equipment. And, outputs signals constructing STM-16 by dummy signals. Extracts STM-4 including the specified channel, and outputs the re-calculated B1 and B2 bytes, in the extract side,
	Bit rate	STM-0, STM-1, STM-4
	Interface	STM-4
9.5	CID mode	
	all"0"/all"1"	0～100Byte , all"0"/all"1" alternate
	PN pattern	PN7 In the CID mode, the scrambler of STM-16 stops.
	Measurement	LOS, LOF, OOF, PN7 error
9.6	Test Pattern (Non-Frame, Concatenation)	PN11,PN15,PN20,PN23,PN20(Zero Suppress),PN31,16bit-word,all"0",all"1" In the non-frame mode, the scrambler of STM-16 stops.
9.7	Error addition Timing	FAS, Bit all, Bit info**,B1, B2,B3*,HP-IEC*,MS-REI,HP-REI*,TC-REI*,OEI* Single : Single(Burst)bit(1～64000) User Program : aE-b (a=1.0～9.9 step 0.1 b=2～10) Ratio : all, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, 1E-9 Alternative : error=0～8000 , normal=1～8000(frame) * : Concatenation ** : NonFrame,CID,Concatenation-16C

Item No.	Item	Specification
9.8	Alarm addition	LOS, LOF, MS-AIS, AU-AIS, AU-LOP, HP-SLM*, HP-TIM*, HP-RDI*, HP-UNEQ* * : Concate Through
	Timing	Single : Single(burst)frame(0～8000) Alternative : alarm=0～8000 , normal=1～8000(frame), All
9.9	OH preset data	SOH : All bytes other than B1,B2, H1, H2, and H3 VC3/VC4 POH : All bytes other than B3 VC1 POH : All bytes other than BIP-2 - They can be set in plain languages or bit.
9.10	Pointer setting (Dummy Channel)	AU pointer : 522 (fixed) SS : 00～11 TU pointer : 0 (fixed) SS : 00～11
9.11	Path Trace (Dummy Channel)	J1,J2 (with or without CRC7) inserted in the TX side ASCII データ (64byte)
9.12	Pay Load (Dummy channel)	
	Mode	Copy / Dummy
	Dummy Pattern	all"0", all"1", PN11, PN15 1)Dummy channel of STM1/STS3 with a measurement channel has the mapping up to the same level as the measurement channel. 2)Dummy channel of STM1/STS3 without measurement channel has the mapping up to bulk of the same level as the measurement channel
	☆In-service	
9.13	Error measurement (In-service)	B1,B2,MS-REI Measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-1, 1.0E-00, < 1.0E-15
9.14	Alarm measurement (In-service)	Powerfail,LOS, LOF, OOF, Measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.15	Performance (In-service)	G826(SDH) : B1,B2,B3,BIP-2,MS-REI,HP-REI,LP-REI measurement range ES, SES, ESR, SESR, BBER, US, BBE, SDP : 0～999999, 1.0E06～9.9E15, 9.9E15
	☆Out-of-service	
9.16	Error measurement (Out-of-service)	B1,B2,B3*,MS-REI,BitInfo** * : Concatenation-16C ** : NonFrame,CID,Concatenation 16C measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, < 1.0E-15
9.17	Alarm measurement (Out-of-service)	Powerfail,LOS, LOF, OOF, Sync.loss** ** : NonFrame,CID,Concatenation 16C 時のみ measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm Count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15
9.18	Performance (Out-of-service)	G826 : B1,B2,B3,MS-REI measurement range : ES,SES,ESR,SESR,BBER,US,BBE,SDP 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.19	Detection・Release conditions	Measurement ON/OFF LOS Detection : optical signal loss Release : optical signal detected OOF Detection : 4frames Release : 2frames LOF Detection : 1～5ms/step0.1ms(3msec) Release : 1～5ms/step0.1ms(3msec)

Item No.	Item	Specification
9.20	OH test	
9.20.1	OH monitor	SOH of the specified channel or payload 9×9 bytes
9.20.2	OH capture Depth Setting Trigger Out Trigger In Trigger point	SOH/POH 1byte is inputted by a trigger shown below (Trigger In). 1023byte SOH/POH の 1byte Measurable error/alarm - including error/alarm of SDH - 1 to 1023 are settable.
9.20.3	OH change Timing	SOH/POH 1byte,RSOH,MSOH,SOH,POH (except for B1, B2, B3, and BIP-2) A-pattern : 1～64frame , B-pattern : 1～64frame Alternative : A=1～8000 , B=1～8000
9.20.4	OH BERT Test pattern	SOH/POH 1byte (except for B1, B2, B3, and BIP-2) Pattern : OFF, 2^{11}-1,2^{15}-1(INV)
9.20.5	OH add/drop	SOH/POH 1byte (except for the add of B1, B2, B3, and BIP-2) Setting : ON/OFF
9.21	Delay measurement	
9.21.1	Measurement period	0.5,1,2,5,10 s
9.21.2	measurement range	0～999 μs, 1.0～999.9ms, 1.0～10.0s, >Timeout
9.21.3	Accuracy	±5 μs at period = 0.5/1 s, ±50 μs at 2/5/10 s

Item No.	Item	Specification
9.22	Frame memory (TX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Configuration	A frame : length(1 to 64 frame)×repeat(1 to 8000 frame) B frame : length(63 to 0 frame)×repeat(1 to 8000 frame)
	OH pattern	Copies OH preset data to all frames, user program
	Payload pattern	all"0" , all"1", Playback (outputs the captured data)
	Parity	B1 and B2 are automatically calculated. Adding concatenation B3: on/off
	Error addition	FAS, Bit all,B1,B2,B3,MS-REI
	Alarm addition	LOS,LOF,MS-AIS,MS-RDI
	K1,K2setting	Same as (SDH)
	Pointer setting	Same as (SDH)
	Path trace setting	Sane as (SDH)
9.23	Frame capture (RX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Trigger	Measurable error/alarm alarm K1／K2 : same/not same trigger (16bit mask, possible) NDF, +PJC, -PJC, 3cons, manual, External
	Trigger point	1～64 (32)

Item No.	Item	Specification
9.24	Jitter	
9.24.1	Intrinsic jitter	

Bit rate(bit/s)	range	Additional error (UIp-p) *SDH Internal	
		HP1+LP	HP2+LP
		Spec.	spec.
2488.320M	2UI	0.10	0.05
	32UI	2.2	1.1

*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP1 + LP, HP2+LP,Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.01UIp-p/dB with input level < -12dBm

Bit rate(bit/s)	range	Additional error (UIrms) *SDH Internal	
		spec.	
2488.320M	2UI	0.027	
	32UI	0.55	

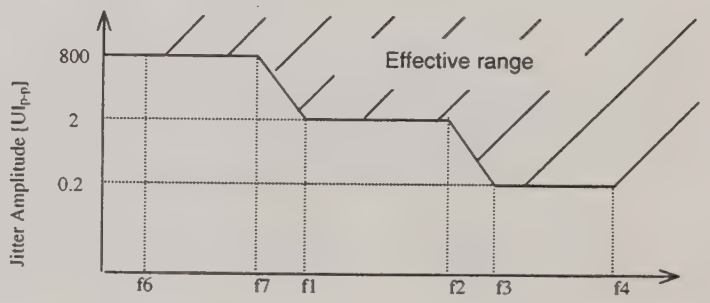
*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP + LP, Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.002UIrms/dB with input level < -12dBm

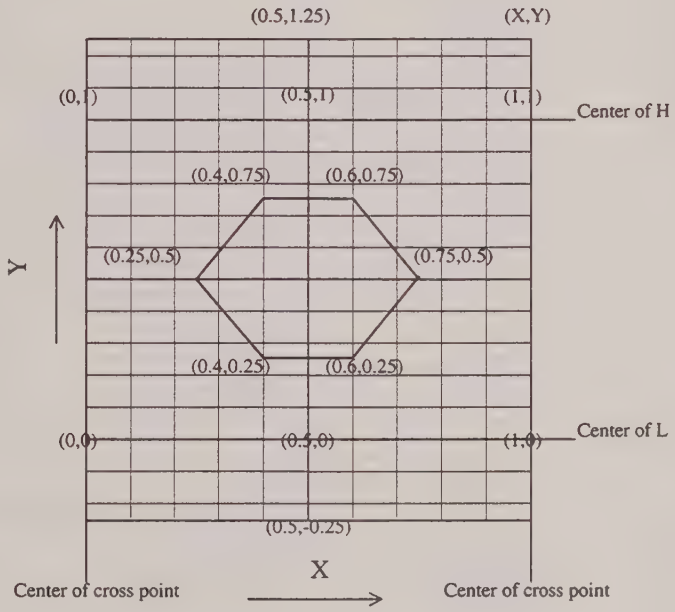
9.24.2 Jitter tolerance



measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Narrow

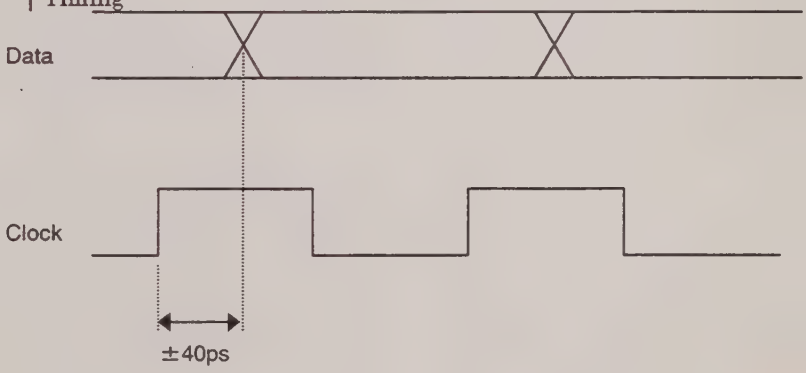
Bit Rate	Jitter Frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Item No.	Item	Specification
10	General	
10.1	Dimensions, mass	21mm(H)× 255mm(W)× 167.6mm(D) (Excluding projections) Less than 2.0kg
10.2	Operation temperature	0～+40℃
10.3	Storage temperature	-20～+60℃
11	Eye mask (in using 4th Bessel LPF)	

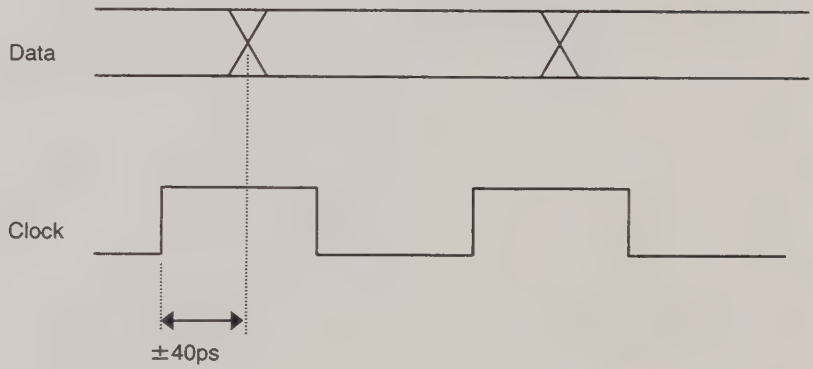
A.5 Specifications of the MU150009A 2.5G(1.55) Unit

Item No.	Item	Specification
1	Optical input signal	
1.1	Bit rate	2488.320Mbit/s±100ppm
1.2	Input signal code	NRZ
1.3	Receive optical wavelength band	1550nm band
1.4	Optical input level (PN average power)	Narrow:-27～-9dBm(BER 1×10^{-10}or less, at 0 - 30℃) Wide :-20～-9dBm(BER 1×10^{-10}or less,10 - 40℃)
1.5	Absolute Maximum input power	0 dBm(peak power)
1.6	Optical Input return loss	27dB or more
1.7	Connector	FC-PC(SMF)
2	Optical output signal	
2.1	Bit rate	2488.32Mbit/s±100ppm
2.2	Optical source type	1550nm band optical source : DFB-LD
2.3	Peak wavelength	1550nm band optical source : 1550nm±20nm
2.4	Wavelength width	1.0nm max. (Full width at -20dB)
2.5	Side mode suppression ratio	30dB or more
2.6	Optical output power	-4dBm±3dB (PN average power)
2.7	Output signal code	NRZ
2.8	Optical output wave form	In accordance with Eye mask specification using 4th Bessel LPF(see Item No .9)
2.9	Extinction ratio	10dB or more
2.10	Connector	FC-PC(SMF)

Item No.	Item	Specification
3	Electric input signal	
	Data input	
3.1	Bit rate	2488.320Mbit/s±100ppm
3.2	Input signal level	
	Data input mode	ECL
	Monitor input mode	0.1～1V(p-p)
3.3	Input signal code	NRZ
3.4	Impedance	
	Data input mode	50Ω / -2V termination
	Monitor input mode	50Ω AC
3.5	Connector	SMA
	Clock input	
3.6	Frequency	2488.320MHz±100ppm
3.7	Input signal level	ECL(50Ω / -2V termination)
3.8	Clock/Data phase	Timing
3.9	Connector	SMA



Item No.	Item	Specification
4	External clock input	
4.1	Frequency	2488.320MHz±100ppm
4.2	Impedance	50Ω AC
4.3	Connector	SMA
5	Electric output signal	
	Data output	
5.1	Bit rate	2488.320MHz±100ppm
5.2	Output signal level	ECL
5.3	Output signal code	NRZ
5.4	Impedance	50Ω / -2V termination
5.5	Connector	SMA
	Clock output	
5.6	Frequency	2488.320MHz±100ppm
5.7	Output signal level	ECL
5.8	Clock/Data phase	Timing
5.9	Impedance	50Ω / -2V termination
5.10	Connector	SMA
6	Clock sync. output	
6.1	Frequency	155.520MHz±100ppm
6.2	Output signal level	ECL (50Ω AC)
6.3	Connector	SMA



Item No.	Item	Specification
7	Receive clock output	
7.1	Frequency	2488.320MHz±100ppm
7.2	Output signal level	ECL (AC)
7.3	Connector	SMA
8	Optical functions	
8.1	Transmission bandwidth selection	Selection of Wide or Narrow
8.2	Optical input power measurement	-
8.2.1	Measurement rage	- 30 to - 9 dBm (1550 nm, peak power)
8.2.2	Absolute accuracy	± 1 dB or less (at - 20 dBm, 1550 nm)
8.2.3	Linearity	± 1 dB or less (at - 30 to - 9 dBm, 1550 nm)
8.3	Optical output control	The key switch is used to control the emission of an optical output.
8.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
8.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation power When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
8.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 8.3 and 8.4 are performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
8.7	Laser safety standard	21 CFR1040.10 : CLASSⅢb IEC 825-1 : CLASS 3A
8.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
9	Electric functions)	
9.1	Mapping	See "1.5 Mapping Route Measurable When Installing the
9.2	Concatenation mapping	2.5G Unit".
9.3	Through mode	Only when Tx&Rx mode
	Bit rate	2488.320Mbit/s
	Mode	Transparent through, OH overwrite, Payload overwrite, add/drop
9.4	Insert/Extract mode	Inserts the payloads of STM-n (n=0 - 4) signals inputted from external equipment. And, outputs signals constructing STM-16 by dummy signals. Extracts STM-4 including the specified channel, and outputs the re-calculated B1 and B2 bytes, in the extract side,
	Bit rate	STM-0, STM-1, STM-4
	Interface	STM-4
9.5	CID mode	
	all"0"/all"1"	0～100Byte , all"0"/all"1" alternate
	PN pattern	PN7 In the CID mode, the scrambler of STM-16 stops.
	Measurement	LOS, LOF, OOF, PN7 error
9.6	Test Pattern (Non-Frame, Concatenation)	PN11,PN15,PN20,PN23,PN20(Zero Suppress),PN31,16bit-word,all"0",all"1" In the non-frame mode, the scrambler of STM-16 stops.
9.7	Error addition Timing	FAS, Bit all, Bit info**,B1, B2,B3*,HP-IEC*,MS-REI,HP-REI*,TC-REI*,OEI* Single : Single(Burst)bit(1～64000) User Program : aE-b (a=1.0～9.9 step 0.1 b=2～10) Ratio : all, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, 1E-9 Alternative : error=0～8000 , normal=1～8000(frame) * : Concatenation ** : NonFrame,CID,Concatenation-16C

Item No.	Item	Specification
9.8	Alarm addition	LOS, LOF, MS-AIS, AU-AIS, AU-LOP, HP-SLM*, HP-TIM*, HP-RDI*, HP-UNEQ* * : Concate Through
	Timing	Single : Single(burst)frame(0～8000) Alternative : alarm=0～8000 , normal=1～8000(frame), All
9.9	OH preset data	SOH : All bytes other than B1,B2, H1, H2, and H3 VC3/VC4 POH : All bytes other than B3 VC1 POH : All bytes other than BIP-2 - They can be set in plain languages or bit.
9.10	Pointer setting (Dummy Channel)	AU pointer : 522 (fixed) SS : 00～11 TU pointer : 0 (fixed) SS : 00～11
9.11	Path Trace (Dummy Channel)	J1,J2 (with or without CRC7) inserted in the TX side ASCII データ (64byte)
9.12	Pay Load (Dummy channel)	
	Mode	Copy / Dummy
	Dummy Pattern	all"0", all"1", PN11, PN15 1)Dummy channel of STM1/STS3 with a measurement channel has the mapping up to the same level as the measurement channel. 2)Dummy channel of STM1/STS3 without measurement channel has the mapping up to bulk of the same level as the measurement channel
	☆In-service	
9.13	Error measurement (In-service)	B1,B2,MS-REI Measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-1, 1.0E-00, < 1.0E-15
9.14	Alarm measurement (In-service)	Powerfail,LOS, LOF, OOF, Measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.15	Performance (In-service)	G826(SDH) : B1,B2,B3,BIP-2,MS-REI,HP-REI,LP-REI measurement range ES, SES, ESR, SESR, BBER, US, BBE, SDP : 0～999999, 1.0E06～9.9E15, 9.9E15
	☆Out-of-service	
9.16	Error measurement (Out-of-service)	B1,B2,B3*,MS-REI,BitInfo** * : Concatenation-16C ** : NonFrame,CID,Concatenation 16C measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, < 1.0E-15
9.17	Alarm measurement (Out-of-service)	Powerfail,LOS, LOF, OOF, Sync.loss** ** : NonFrame,CID,Concatenation 16C 時のみ measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm Count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15
9.18	Performance (Out-of-service)	G826 : B1,B2,B3,MS-REI measurement range : ES,SES,ESR,SESR,BBER,US,BBE,SDP 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.19	Detection・Release conditions	Measurement ON/OFF LOS Detection : optical signal loss Release : optical signal detected OOF Detection : 4frames Release : 2frames LOF Detection : 1～5ms/step0.1ms(3msec) Release : 1～5ms/step0.1ms(3msec)

Item No.	Item	Specification
9.20	OH test	
9.20.1	OH monitor	SOH of the specified channel or payload 9×9 bytes
9.20.2	OH capture Depth Setting Trigger Out Trigger In Trigger point	SOH/POH 1byte is inputted by a trigger shown below (Trigger In). 1023byte SOH/POH の 1byte Measurable error/alarm - including error/alarm of SDH - 1 to 1023 are settable.
9.20.3	OH change Timing	SOH/POH 1byte,RSOH,MSOH,SOH,POH (except for B1, B2, B3, and BIP-2) A-pattern : 1～64frame , B-pattern : 1～64frame Alternative : A=1～8000 , B=1～8000
9.20.4	OH BERT Test pattern	SOH/POH 1byte (except for B1, B2, B3, and BIP-2) Pattern : OFF, 2^{11}-1,2^{15}-1(INV)
9.20.5	OH add/drop	SOH/POH 1byte (except for the add of B1, B2, B3, and BIP-2) Setting : ON/OFF
9.21	Delay measurement	
9.21.1	Measurement period	0.5,1,2,5,10 s
9.21.2	measurement range	0～999 μs, 1.0～999.9ms, 1.0～10.0s, >Timeout
9.21.3	Accuracy	±5 μs at period = 0.5/1 s, ±50 μs at 2/5/10 s

Item No.	Item	Specification
9.22	Frame memory (TX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Configuration	A frame : length(1 to 64 frame)×repeat(1 to 8000 frame) B frame : length(63 to 0 frame)×repeat(1 to 8000 frame)
	OH pattern	Copies OH preset data to all frames, user program
	Payload pattern	all"0" , all"1", Playback(outputs the captured data)
	Parity	B1 and B2 are automatically calculated. Adding concatenation B3: on/off
	Error addition	FAS, Bit all,B1,B2,B3,MS-REI
	Alarm addition	LOS,LOF,MS-AIS,MS-RDI
	K1,K2setting	Same as (SDH)
	Pointer setting	Same as (SDH)
	Path trace setting	Sane as (SDH)
9.23	Frame capture (RX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Trigger	Measurable error/alarm alarm K1／K2 : same/not same trigger (16bit mask, possible) NDF, +PJC, -PJC, 3cons, manual, External
	Trigger point	1～64 (32)

Item No.	Item	Specification
9.24 9.24.1	Jitter Intrinsic jitter	

Bit rate(bit/s)	range	Additional error (UIp-p) *SDH Internal	
		HP1+LP	HP2+LP
		Spec.	spec.
2488.320M	2UI	0.10	0.05
	32UI	2.2	1.1

*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP1 + LP, HP2+LP,Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.01UIp-p/dB with input level < -12dBm

Bit rate(bit/s)	range	Additional error (UIrms) *SDH Internal	
		spec.	
2488.320M	2UI	0.027	
	32UI	0.55	

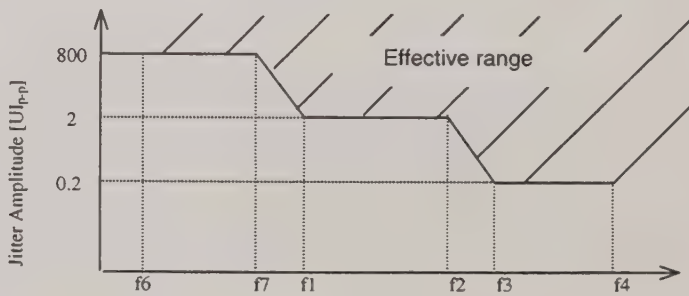
*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP + LP, Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.002UIrms/dB with input level < -12dBm

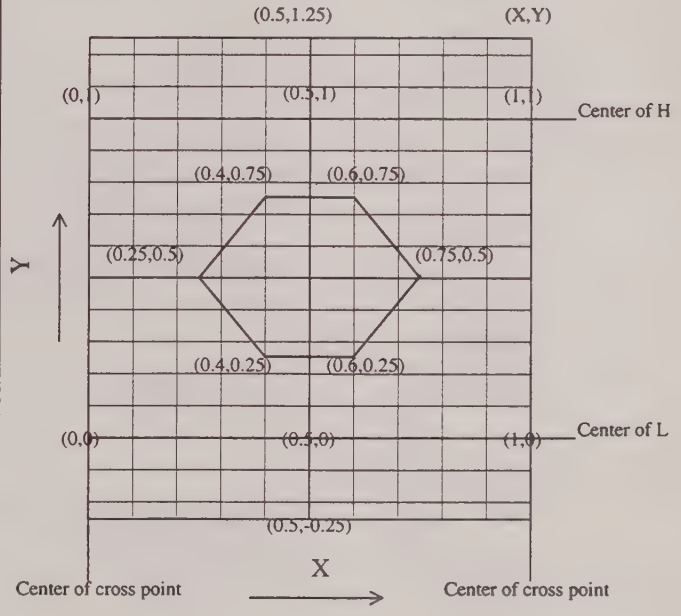
9.24.2 Jitter tolerance



measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Narrow

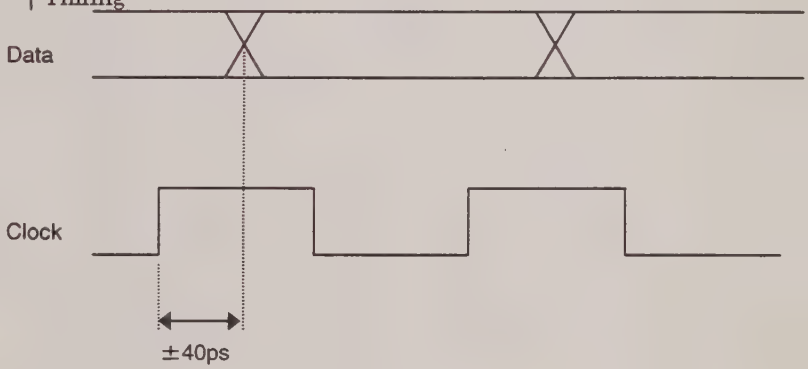
Bit Rate	Jitter Frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Item No.	Item	Specification
10	General	
10.1	Dimensions, mass	21mm(H)× 255mm(W)× 167.6mm(D) (Excluding projections) Less than 2.0kg
10.2	Operation temperature	0～+40℃
10.3	Storage temperature	-20～+60℃
11	Eye mask (in using 4th Bessel LPF)	

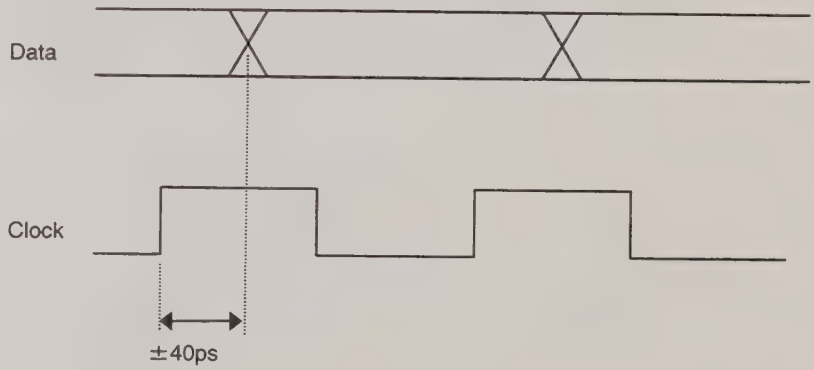
A.6 Specifications of the MU150010A 2.5G(1.31/1.55) Unit

Item No.	Item	Specification
1	Optical input signal	
1.1	Bit rate	2488.320Mbit/s±100ppm
1.2	Input signal code	NRZ
1.3	Receive optical wavelength band	1310/1550nm band
1.4	Optical input level (PN average power)	Narrow:-27～-9dBm(BER 1×10^{-10}or less, at 0 - 30℃) Wide :-20～-9dBm(BER 1×10^{-10}or less,10 - 40℃)
1.5	Absolute Maximum input power	0 dBm(peak power)
1.6	Optical Input return loss	27dB or more
1.7	Connector	FC-PC(SMF)
2	Optical output signal	
2.1	Bit rate	2488.32Mbit/s±100ppm
2.2	Optical source type	1310nm band optical source : DFB-LD 1550nm band optical source : DFB-LD
2.3	Peak wavelength	1310nm band optical source : 1310nm±20nm 1550nm band optical source : 1550nm±20nm
2.4	Wavelength width	1.0nm max. (Full width at -20dB)
2.5	Side mode suppression ratio	30dB or more
2.6	Optical output power	-4dBm±3dB (PN average power)
2.7	Output signal code	NRZ
2.8	Optical output wave form	In accordance with Eye mask specification using 4th Bessel LPF(see Item No .9)
2.9	Extinction ratio	10dB or more
2.10	Connector	FC-PC(SMF)

Item No.	Item	Specification
3	Electric input signal	
	Data input	
3.1	Bit rate	2488.320Mbit/s±100ppm
3.2	Input signal level	
	Data input mode	ECL
	Monitor input mode	0.1～1V(p-p)
3.3	Input signal code	NRZ
3.4	Impedance	
	Data input mode	50Ω / -2V termination
	Monitor input mode	50Ω AC
3.5	Connector	SMA
	Clock input	
3.6	Frequency	2488.320MHz±100ppm
3.7	Input signal level	ECL(50Ω / -2V termination)
3.8	Clock/Data phase	Timing
3.9	Connector	SMA



Item No.	Item	Specification
4	External clock input	
4.1	Frequency	2488.320MHz±100ppm
4.2	Impedance	50Ω AC
4.3	Connector	SMA
5	Electric output signal	
	Data output	
5.1	Bit rate	2488.320MHz±100ppm
5.2	Output signal level	ECL
5.3	Output signal code	NRZ
5.4	Impedance	50Ω / -2V termination
5.5	Connector	SMA
	Clock output	
5.6	Frequency	2488.320MHz±100ppm
5.7	Output signal level	ECL
5.8	Clock/Data phase	Timing
5.9	Impedance	50Ω / -2V termination
5.10	Connector	SMA
6	Clock sync. output	
6.1	Frequency	155.520MHz±100ppm
6.2	Output signal level	ECL (50Ω AC)
6.3	Connector	SMA



Item No.	Item	Specification
7	Receive clock output	
7.1	Frequency	2488.320MHz±100ppm
7.2	Output signal level	ECL (AC)
7.3	Connector	SMA
8	Optical functions	
8.1	Transmission bandwidth selection	Selection of Wide or Narrow
8.2	Optical input power measurement	-
8.2.1	Measurement rage	- 30 to - 9 dBm (1310/1550 nm, peak power)
8.2.2	Absolute accuracy	± 1 dB or less (at - 20 dBm, 1310/1550 nm)
8.2.3	Linearity	± 1 dB or less (at - 30 to - 9 dBm, 1330/1550 nm)
8.3	Optical output control	The key switch is used to control the emission of an optical output.
8.4	Laser remote interlock	When the laser remote interlock terminal is opened, the optical output is forcibly turned off.
8.5	Optical output power detection	Power detection threshold value: - 6 to - 8 dB range of ordinary operation power When the optical output power exceeds the threshold value, the lamp comes on. When the optical output power falls below the threshold value, the lamp goes off.
8.6	Optical output delayed transmission	When the on-operation of optical output power of the function described in Item 9.3.1, 9.3.2, or 9.3.3 is performed, the display comes on. When the optical output light is emitted several seconds after the optical output power is turned on, the display comes on.
8.7	Laser safety standard	21 CFR1040.10 : CLASS Ⅲb IEC 825-1 : CLASS 3A
8.8	INPUT LOS detection	Detects an input loss (at - 40 to - 35 dBm or without data signal input).

Item No.	Item	Specification
9	Electric functions)	
9.1	Mapping	See "1.5 Mapping Route Measurable When Installing the
9.2	Concatenation mapping	2.5G Unit".
9.3	Through mode	Only when Tx&Rx mode
	Bit rate	2488.320Mbit/s
	Mode	Transparent through, OH overwrite, Payload overwrite, add/drop
9.4	Insert/Extract mode	Inserts the payloads of STM-n (n=0 - 4) signals inputted from external equipment. And, outputs signals constructing STM-16 by dummy signals. Extracts STM-4 including the specified channel, and outputs the re-calculated B1 and B2 bytes, in the extract side,
	Bit rate	STM-0, STM-1, STM-4
	Interface	STM-4
9.5	CID mode	
	all"0"/all"1"	0～100Byte , all"0"/all"1" alternate
	PN pattern	PN7 In the CID mode, the scrambler of STM-16 stops.
	Measurement	LOS, LOF, OOF, PN7 error
9.6	Test Pattern (Non-Frame, Concatenation)	PN11,PN15,PN20,PN23,PN20(Zero Suppress),PN31,16bit-word,all"0",all"1" In the non-frame mode, the scrambler of STM-16 stops.
9.7	Error addition Timing	FAS, Bit all, Bit info**,B1, B2,B3*,HP-IEC*,MS-REI,HP-REI*,TC-REI*,OEI* Single : Single(Burst)bit(1～64000) User Program : aE-b (a=1.0～9.9 step 0.1 b=2～10) Ratio : all, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, 1E-9 Alternative : error=0～8000 , normal=1～8000(frame) * : Concatenation ** : NonFrame,CID,Concatenation-16C

Item No.	Item	Specification
9.8	Alarm addition	LOS, LOF, MS-AIS, AU-AIS, AU-LOP, HP-SLM*, HP-TIM*, HP-RDI*, HP-UNEQ* * : Concate Through
	Timing	Single : Single(burst)frame(0～8000) Alternative : alarm=0～8000 , normal=1～8000(frame), All
9.9	OH preset data	SOH : All bytes other than B1,B2, H1, H2, and H3 VC3/VC4 POH : All bytes other than B3 VC1 POH : All bytes other than BIP-2 - They can be set in plain languages or bit.
9.10	Pointer setting (Dummy Channel)	AU pointer : 522 (fixed) SS : 00～11 TU pointer : 0 (fixed) SS : 00～11
9.11	Path Trace (Dummy Channel)	J1,J2 (with or without CRC7) inserted in the TX side ASCII データ (64byte)
9.12	Pay Load (Dummy channel)	
	Mode	Copy / Dummy
	Dummy Pattern	all"0", all"1", PN11, PN15 1)Dummy channel of STM1/STS3 with a measurement channel has the mapping up to the same level as the measurement channel. 2)Dummy channel of STM1/STS3 without measurement channel has the mapping up to bulk of the same level as the measurement channel
	☆In-service	
9.13	Error measurement (In-service)	B1,B2,MS-REI Measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-1, 1.0E-00, < 1.0E-15
9.14	Alarm measurement (In-service)	Powerfail,LOS, LOF, OOF, Measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.15	Performance (In-service)	G826(SDH) : B1,B2,B3,BIP-2,MS-REI,HP-REI,LP-REI measurement range ES, SES, ESR, SESR, BBER, US, BBE, SDP : 0～999999, 1.0E06～9.9E15, 9.9E15
	☆Out-of-service	
9.16	Error measurement (Out-of-service)	B1,B2,B3*,MS-REI,BitInfo** * : Concatenation-16C ** : NonFrame,CID,Concatenation 16C measurement range Error Count : 0～999999, 1.0E06～9.9E15, > 9.9E15 Error Ratio : 1.0E-15～9.9E-01, 1.0E-00, < 1.0E-15
9.17	Alarm measurement (Out-of-service)	Powerfail,LOS, LOF, OOF, Sync.loss** ** : NonFrame,CID,Concatenation 16C 時のみ measurement range Alarm Seconds : 0～999us,1～999ms,1～999999s,1.0E06～9.9E15, > 9.9E15 Alarm Count(frame): 0～999999, 1.0E06～9.9E15, > 9.9E15
9.18	Performance (Out-of-service)	G826 : B1,B2,B3,MS-REI measurement range : ES,SES,ESR,SESR,BBER,US,BBE,SDP 0～999999, 1.0E06～9.9E15, > 9.9E15

Item No.	Item	Specification
9.19	Detection・Release conditions	Measurement ON/OFF LOS Detection : optical signal loss Release : optical signal detected OOF Detection : 4frames Release : 2frames LOF Detection : 1～5ms/step0.1ms(3msec) Release : 1～5ms/step0.1ms(3msec)

Item No.	Item	Specification
9.20	OH test	
9.20.1	OH monitor	SOH of the specified channel or payload 9×9 bytes
9.20.2	OH capture Depth Setting Trigger Out Trigger In Trigger point	SOH/POH 1byte is inputted by a trigger shown below (Trigger In). 1023byte SOH/POH の 1byte Measurable error/alarm - including error/alarm of SDH - 1 to 1023 are settable.
9.20.3	OH change Timing	SOH/POH 1byte,RSOH,MSOH,SOH,POH (except for B1, B2, B3, and BIP-2) A-pattern : 1～64frame , B-pattern : 1～64frame Alternative : A=1～8000 , B=1～8000
9.20.4	OH BERT Test pattern	SOH/POH 1byte (except for B1, B2, B3, and BIP-2) Pattern : OFF, 2^{11}-1,2^{15}-1(INV)
9.20.5	OH add/drop	SOH/POH 1byte (except for the add of B1, B2, B3, and BIP-2) Setting : ON/OFF
9.21	Delay measurement	
9.21.1	Measurement period	0.5,1,2,5,10 s
9.21.2	measurement range	0～999 μs, 1.0～999.9ms, 1.0～10.0s, >Timeout
9.21.3	Accuracy	±5 μs at period = 0.5/1 s, ±50 μs at 2/5/10 s

Item No.	Item	Specification
9.22	Frame memory (TX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Configuration	A frame : length(1 to 64 frame)×repeat(1 to 8000 frame) B frame : length(63 to 0 frame)×repeat(1 to 8000 frame)
	OH pattern	Copies OH preset data to all frames, user program
	Payload pattern	all"0" , all"1", Playback (outputs the captured data)
	Parity	B1 and B2 are automatically calculated. Adding concatenation B3: on/off
	Error addition	FAS, Bit all,B1,B2,B3,MS-REI
	Alarm addition	LOS,LOF,MS-AIS,MS-RDI
	K1,K2setting	Same as (SDH)
	Pointer setting	Same as (SDH)
	Path trace setting	Sane as (SDH)
9.23	Frame capture (RX)	
	Memory size	STM-16×64frame (2.5Mbyte)
	Trigger	Measurable error/alarm alarm K1／K2 : same/not same trigger (16bit mask, possible) NDF, +PJC, -PJC, 3cons, manual, External
	Trigger point	1～64 (32)

Item No.	Item	Specification
9.24 9.24.1	Jitter Intrinsic jitter	

Bit rate(bit/s)	range	Additional error (UIp-p) *SDH Internal	
		HP1+LP	HP2+LP
		Spec.	spec.
2488.320M	2UI	0.10	0.05
	32UI	2.2	1.1

*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP1 + LP, HP2+LP,Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.01UIp-p/dB with input level < -12dBm

Bit rate(bit/s)	range	Additional error (UIrms) *SDH Internal	
		規格	社内規格
2488.320M	2UI	0.027	0.024
	32UI	0.55	0.50

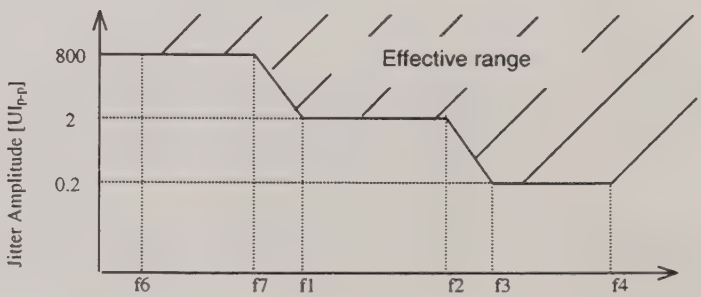
*SDH Internal : VC4-16c , Info : PRBS2^{23}-1, HP + LP, Scramble:ON

measurement conditions

Input level:-12～-10dBm, +10℃～+40℃, Wide

additional 0.002UIrms/dB with input level < -12dBm

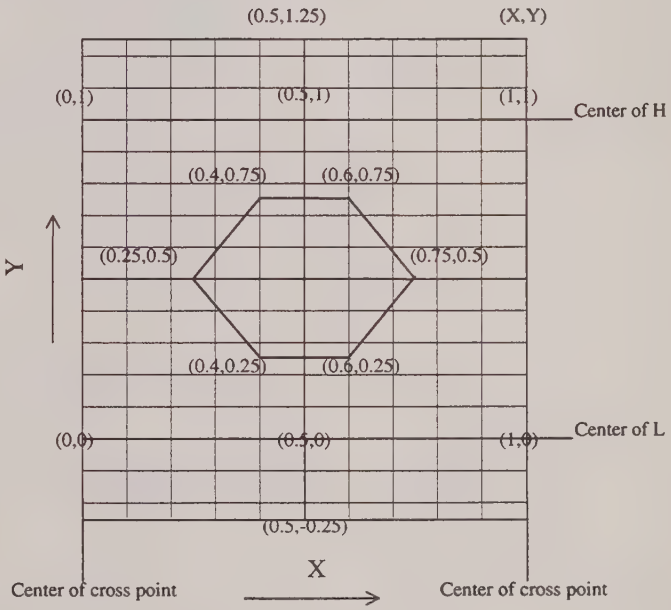
9.24.2 Jitter tolerance



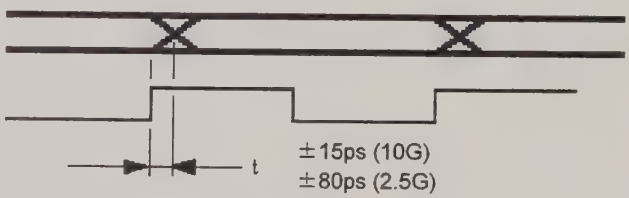
measurement conditions

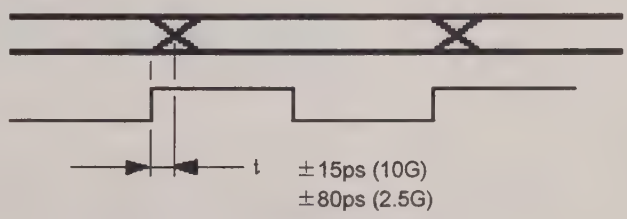
Input level:-12～-10dBm, +10℃～+40℃, Narrow

Bit Rate	Jitter Frequency [Hz]					
	f6	f7	f1	f2	f3	f4
2.5Gbit/s	10	12.1	5K	100K	1M	20M

Item No.	Item	Specification
10	General	
10.1	Dimensions, mass	21mm(H)× 255mm(W)× 167.6mm(D) (Excluding projections) Less than 2.0kg
10.2	Operation temperature	0～+40℃
10.3	Storage temperature	-20～+60℃
11	Eye mask (in using 4th Bessel LPF)	

A.7 Specifications of MU150000A 2.5G/10G unit

	Item	Specification
1.	Electrical performance	
1.1	External interface at transmission side	
1.1.1	Clock Output	Function : 2.5GHz ・ 10GHz clock output Frequency : 9953.28MHz 2488.32MHz (However, the accuracy varies by the clock used in Item 2.1.1.) Level : >= 0.65Vpp at H: 0 to-0.2V, L: -0.85 to -1.2V Connector : SMA Impedance : 50Ω
1.1.2	Data Output	Function : 2.5Gbit/s ・ 10Gbit/s data output Bit rate : 9953.28Mbit/s 2488.32Mbit/s Level : >= 0.65Vpp at H: 0 to-0.2V, L: -0.85 to -1.2V Code : NRZ Connector : SMA Impedance : 50Ω Timing : 
1.1.3	Clock Sync. Output	Function : 156M synchronization output Frequency : 155.52MHz (The accuracy varies by the clock used in Item 2.1.1.) Level : ECL(AC) Connector : SMA Impedance : 50Ω
1.1.4	Internal Clock Output	Function : 10GHz Internal clock output Frequency : 9953.28MHz (However, the accuracy depends on the main unit.) Level : $1V_{(p-p)}\pm0.3V$ Connector : SMA Impedance : 50Ω

	Item	Specification
1.1.5	External Clock Input	Function : 2.5GHz ・ 10GHz external clock input Frequency : 9953.28MHz±100ppm 2488.32MHz±100ppm Level : 1.2 - 0.6Vpp Connector : SMA Impedance : 50Ω
1.2	External interface at receive side	
1.2.1	Clock input	Function : 2.5GHz ・ 10GHz clock input Frequency : 9953.28MHz±100ppm 2488.32MHz±100ppm Level : 0.65 - 1.3Vpp Connector : SMA Impedance : 50Ω
1.2.2	Data input	Function : 2.5Gbit/s ・ 10Gbit/s data input Bit rate : 9953.28Mbit/s±100ppm 2488.32Mbit/s±100ppm Level : 0.65 - 1.3Vpp Code : NRZ Connector : SMA Impedance : 50Ω Timing : 
1.2.3	Receive clock output	Function : receive clock output (for Jitter) Frequency : Depends on the frequency from the Clock input. Level : H: 0 to -0.4V L: -0.9 to -1.3V at 1Vpp±0.3V Connector : SMA Impedance : 50Ω

	Item	Specification
2	Function	
2.1	Transmission function	
2.1.1	Clock	Internal, External, Receive, Lock(1.5M/2M) Frequency and accuracy vary by each item: Internal : Depends on SDH/SONET. External : Depends on the input of Item 1.1.5. Receive : Depends on the input of Item 1.2.1.
2.1.2	Frame format	Without frame, with frame, and CID pattern
2.1.2.1	Without frame	Generates the test pattern shown in Item 2.1.4.
2.1.2.2	With frame	Generates the 2.5G and 10G signals in accordance with the mapping shown in Item 2.1.3. Signals including the test channel of STM1/STM3 are received from the main unit when using STM64/STS192 and STM16/STS48. In this case, this unit generates the dummy signal of STM1/STS3.
2.1.2.3	CID pattern	Continuous 0/1 signal : 0～100Byte PRB/S : 2^7-1
2.1.3	Mapping	See "1.5 Mapping Route Measurable When Installing the 2.5G Unit" and "1.6 Mapping Route Measurable When Installing the 2.5G/10G and 10G Units". SDH/SONET * : SDH and SONET have a same mapping despite the name difference.

	Item	Specification
2.1.4	Test pattern	*: Following test patterns are generated as test channel patterns when using STM64C/STS192C, STM16C/STS48C, and the Without frame: PRB/S : 2^{15}-1 2^{23}-1 2^{31}-1 Word: 16-bit word pattern All0 All1 * The test pattern depends on the frame format and mapping.
2.1.5	OH preset	SOH/TOH: All bytes except for B1, B2, H1, H2, and H3 VC4 POH/STS3 POH *1: All bytes except for B3 *1 : Corresponds to the Through function when using STM64C/STS192C and STM16C/STS48C. Set them in plain language and in the Bit unit.
2.1.6	Dummy channel	1) Dummy channel of STM1/STS3 with a measurement channel has the mapping up to the same level as the measurement channel. 2) Dummy channel of STM1/STS3 without measurement channel has the mapping up to bulk of the same level as the measurement channel.
2.1.6.1	Mode	Copy, Dummy
2.1.6.2	Dummy pattern	PRB/S : 2^{11}-1 2^{15}-1 Word : All0 All1
2.1.6.3	Dummy channel POH	VC3 POH/STS1 POH : All bytes except for B3 VC4 POH/STS3 POH : All bytes except for B3 VC1 POH/VT POH : All bytes except for BIP-2
2.1.6.4	Dummy channel pointer	AU pointer/STS pointer 522 fixed SS: 00 to 11 TU pointer/VT pointer 0 fixed SS: 00 to 11
2.1.6.5	Dummy channel path trace	J1, J2 (with or without CRC-7) ASCII data

	Item	Specification
2.1.7	Error addition	
2.1.7.1	Type	FAS, Bit All, Bit Info*1, *3, B1, B2, B3*1, *4, MS-REI/REI-L*2, *4 *1 : Errors can be added when using STM64C/STS192C and STM16C/STS48C. *2 : Errors can be added when using the Through function for STM64C/STS192C and STM16C/STS48C. *3 : Errors are inserted in the PRB/S7 section when using the CID pattern. *4 : No error can be added when inserting.
2.1.7.2	Timing	Single Single(burst) : Bit 0～8 × Frame 0～8000 Rate : 10^{-n} (n=3～9) User Program : A×10^{-B} A=1.0 to 9.9 Step 0.1 B=2 to 10 Alternative : Error=0～8000Frame Nomal=1～8000Frame * : Single (burst) and Alternative correspond to FAS, B1, B2, B3, and MS-REI/REI-L only.
2.1.8	Alarm addition	LOF, MS-AIS/AIS-L, MS-RDI/RDI-L*1, AU-AIS/AIS-P*1, *2, AU-LOP/LOP-P*1, *2 *1 : Alarms can be added when using the Through function for STM64C/STS192C and STM16C/STS48C. *2 : No alarm can be added when inserting.
2.1.8.1	Type	
2.1.8.2	Timing	Single Single(burst) : Frame 0～8000 Alternative Error=0～8000Frame Nomal=1～8000Frame All * : Single (burst) and Alternative correspond to LOF, MS-AIS/AIS-L and MS-RDI/RDI-L only.
2.1.9	Insert	Copies the payload of externally input STM signal, adds SOH/TOH, recalculates B1 and B2, and outputs them.
2.1.9.1	Insert signal	STM0/STS1 and STM1/STS3
2.1.9.2	Error/Alarm addition	For the error addition, see Item 2.1.7. For the alarm addition, see Item 2.1.8.

	Item	Specification
2.1.10	OH change SOH/TOH, RSOH, MSOH	
2.1.10.1	Selection position	SOH/TOH : Selected 1 Byte (Except for B1 and B2)
2.1.10.2	Timing	A-pattern : 1～64Frame B-pattern : 1～64Frame Alternative : A=1 to 8000, B = 1 to 8000 times
2.1.11	OH BERT	
2.1.11.1	Selection position	SOH/TOH : Selected 1 Byte (Except for B1 and B2)
2.1.11.2	Pattern	OFF PRBIT/S : 2^{11}-1 2^{15}-1
2.1.12	OH add	
2.1.12.1	Selection position	SOH/TOH : Selected 1 Byte (Except for B1 and B2)
2.1.12.2	Setting	ON, OFF

	Item	Specification
2.2	Receive function	
2.2.1	Frame format	Without frame, with frame, and CID pattern
2.2.1.1	Without frame	Performs the measurement for the test pattern shown in Item 2.2.3.
2.2.1.2	With frame	Same as the main frame
2.2.1.3	CID pattern	Continuous 0/1 signal : 0～100Byte PRB/S : 2^7-1
2.2.2	Mapping	See "1.6 Mapping Route Measurable When Installing the 2.5G/10G and 10G Units". SDH/SONET * : SDH and SONET have the same mapping despite the name difference.

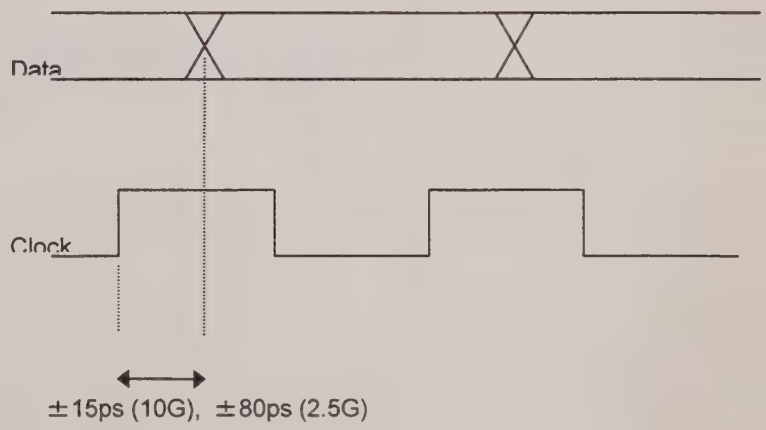
	Item	Specification
2.2.3	Test pattern	PRBS : 2^{15}-1 ($X^{15}+X^{14}+1$) 2^{31}-1 ($X^{31}+X^{28}+1$)*1 Word : 16-bit word pattern All0 All1 * : Above test patterns are measured as the test channel patterns when using STM64C/STS192C, STM16C/STS48C, STM4C/STS12C, and the non-frame format: *1 : It can be measured when using STM64C/STS192C, STM16C/STS48C, and non-frame.
2.2.4	Error/Alarm measurement	
2.2.4.1	Error measurement	Same as the main frame
2.2.4.2	Performance	Same as the main frame
2.2.4.3	Alarm measurement	Same as the main frame

	Item	Specification
2.2.4.4	Detection/release conditions	Same as the main frame
2.2.5	Extract	Extracts the STM1/STS3 signals from the received STM16/STS48 and STM64/STS192 signals, and outputs it fom the interface unit or the MP0121A.
2.2.6	OH monitor	Same as the main frame
2.2.7	OH Capture	Same as the main frame
2.2.8	OH BERT	Same as the main frame
2.2.9	OH Drop	Same as the main frame
2.3	Through	Outputs the received 2.5G and 10G signals as the transmission data.
2.3.1	Mode	Transparent Through Outputs the received data as they are as the transmission data. OH Overwrite SOH : Rewrites the received SOH to the OH Preset. POH : Rewrites the received POH to the OH Preset. All : Rewrites the received SOH/POH to the OH Preset. Payload Overwrite Rewrites the received Payload to the transmission Payload.
2.3.2	Error/Alarm addition	For Error/Alarm addition see Item 2.1 For the Error addition, see Item 2.1.7. For the Alarm addition, see Item 2.1.8.

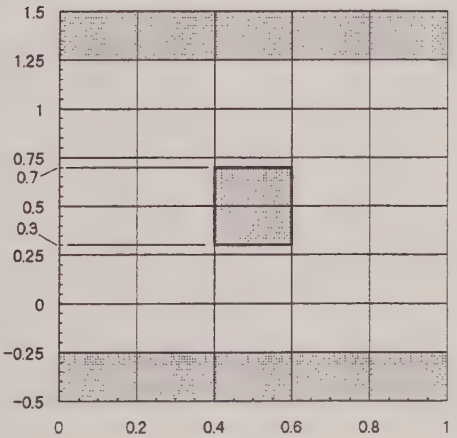
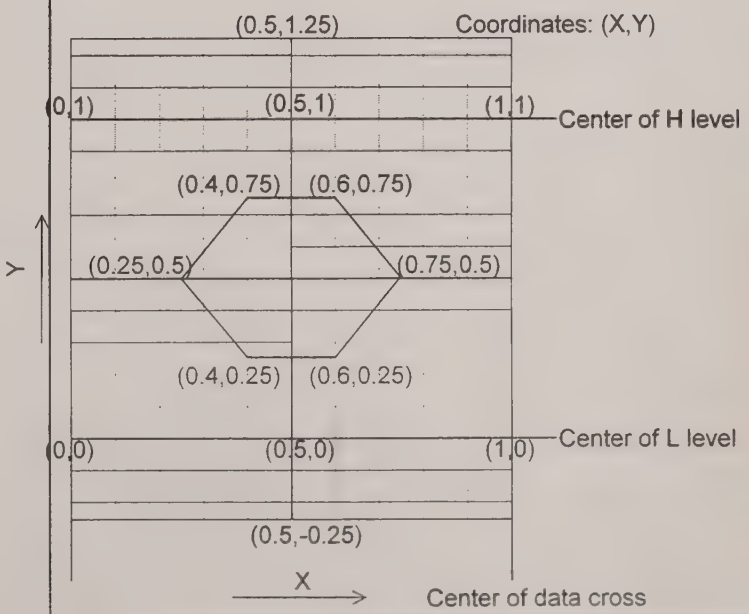
	Item	Specification
2.5	Delay measurement	Function: Measures the time period from time the pattern data is transmitted for the delay measurement to time the pattern data is received. Measurement interval: 0.5, 1, 2, 5, and 10 s Measurement range: 0 to 999 μs, 1.0 to 999.9 ms, 1.0 to 10.0 s > Timeout Display accuracy: ± 5 μs at the 0.5 or 1 s interval or ± 50 μs at the 2, 5, or 10 s interval
3.	Environmental performance	
3.1	Operation temperature	0 to 40℃ (except for the time of FDD operation)
3.2	Storage temperature	-20 to 60℃
4.	Mechanical performance	
4.1	Dimensions	255mm(W)×42mm(H)×167.6mm(D) (Excluding projections)
4.2	Mass	3 kg or less

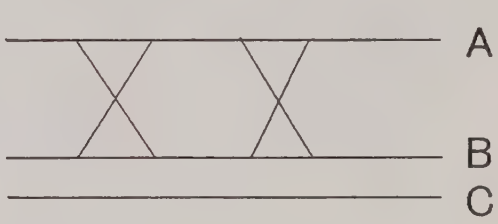
A.8 Specifications of the MU150001A Optical 10G Tx (1.55) Unit

	Item	Specification
1	Optical/Electrical performance Optical output signal	
1.1	Bit rate	9953.28Mbit/s, 2488.32Mbit/s <Option.01, 02, 03>
1.2	Optical source type	1550nm band optical source : DFB-LD (EA modulator built in) 1310nm band optical source : DFB-LD (for Option 01 and 03)
1.3	Peak wavelength	1545nm±20nm
1.4	Spectral width	1315nm±50nm <Option.01, 03> 1.0nm or less (Full width at -20dB)
1.5	Side mode suppression ratio	30dB or more
1.6	Optical output power	-4dBm±3dB(PN average power)
1.7	Optical output signal form	NRZ
1.8	Optical output wave form	In accordance with Eye mask specification using 4th Bessel LPF(see Item 5)
1.9	Extinction ratio	8dB or more (see Item.6)
1.10	Connector	FC-PC (SM fiber)

	Item	Specification
	Electric input signal	
	Data input	
1.11	Bit rate	9953.28Mbit/s±100ppm 2488.32Mbit/s±100ppm (option 01, 02, and 03)
1.12	Input level	H: 0 to -0.2 / L: -0.85 to -1.2V at 0.65Vpp
1.13	Wave form	NRZ
1.14	Impedance	50Ω
1.15	Connector	SMA
	Clock input	
1.16	Frequency	9953.28MHz±100ppm 2488.32MHz±100ppm (option 01, 02, and 03)
1.17	Input Level	H: 0 to -0.2 / L: -0.85 to -1.2V at 0.65Vpp
1.18	Duty	Timing
1.19	Clock/Data phase	
1.20	Impedance	50Ω
1.21	Connector	SMA

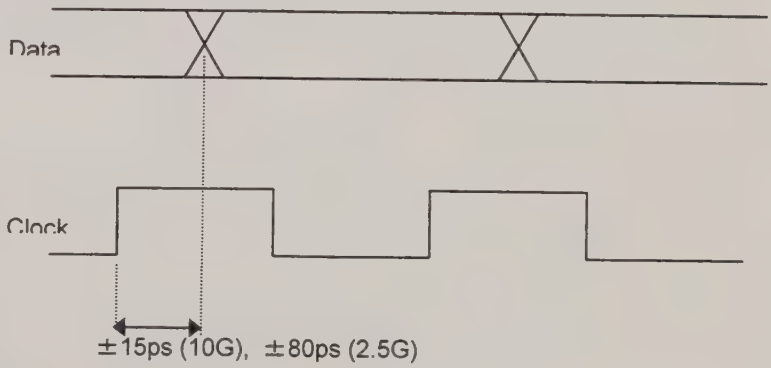
	Item	Specification
1.22	Optical output detection	LED lights when LD is turned on.
1.23	Output control	The key switch is used to control the emission of an optical output.
1.24	Remote interlock	When the remote interlock terminal is opened, the optical output is forcibly turned off.
1.25	Optical output delayed transmission	When the on-operation of optical output power is performed, the display blinks. When the optical output light is emitted a few seconds after the optical output power is turned on, the display comes on.
1.26	Laser safety standard	JIS, IEC 825-1 : CLASS 3A 21 CFR1040.10 : CLASS Ⅲb
	Electric section	
1.27	Alarm addition variable function	LOS
2	Jitter	
2.1	Intrinsic jitter	

	Item	Specification
3	Mechanical performance	
3.1	Dimensions/mass	22(H)×126(W)×254(D), 2 kg or less
4	Environmental performance	
4.1	Operation temperature	0～+40℃
4.2	Storage temperature	-20～+60℃
5	Eye Mask	
	Bit rate : 9.95328Gbit/s	
	Bit rate : 2.48832Gbit/s	 (0.5,1.25) Coordinates: (X,Y) (0,1) (0.5,1) (1,1) Center of H level (0.4,0.75) (0.6,0.75) (0.25,0.5) (0.75,0.5) (0.4,0.25) (0.6,0.25) (0,0) (0.5,0) (1,0) Center of L level (0.5,-0.25) Y X Center of data cross

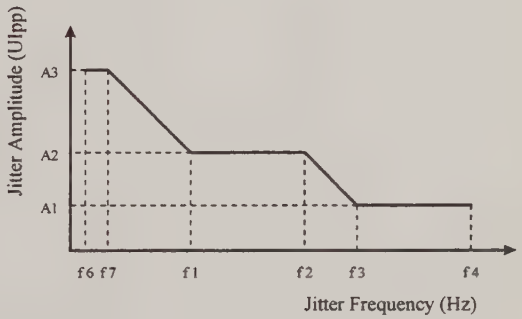
	Item	Specification
6	Extinction ratio measurement measurement	EX (Extinction Ratio) is calculated by the following method based on the waveform when the bit rate is set at 9.95328 Gbit/s: EX=10 · log{(A-C)/(B-C)} A : Average value of "H" level B : Average value of "L" level C : Average level value at the waveform monitor power turned on and the optical input turned off 

A.9 Specifications of the MU150002A Optical 10G Rx (NARROW) Unit

	Item	Specification
1.	Optical/electrical performance Optical input signal	
1.1	Bit rate	9953.28Mbit/s±100ppm 2488.32Mbit/s±100ppm (option 01)
1.2	Receive optical wavelength band	1550nm band (10G) 1310nm band and 1550nm band (2.5G) (option 01)
1.3	Optical input level (PN average power, BER 10^{-12})	10G Optical input : -13～-3dBm 2.5G Optical input : -29～-10dBm(Option.01)
1.4	Absolute maximum input power	0dBm(10G) -8dBm(2.5G) (Option.01)
1.5	Optical input signal code	NRZ
1.6	Optical input return loss	27dB or more 17dB or more (1310nm band, 25G)
1.7	Connector	FC-PC (SM fiber)

	Item	Specification
	Electric output signal Data output	
1.8	Bit rate	9953.28Mbit/s±100ppm 2488.32Mbit/s±100ppm (Option.01)
1.9	Output level	0.65 to 1.3 Vpp
1.10	Wave form	NRZ
1.11	Impedance	50Ω
1.12	Connector	SMA
	Clock output	
1.13	Frequency	9953.28MHz±100ppm 2488.32MHz±100ppm (Option.01)
1.14	Output Level	0.65 to 1.0 Vpp
1.15	Duty	
1.16	Clock/Data phase	Timing
		
1.20	Impedance	50Ω
1.21	Connector	SMA
1.22	Input loss detection	Detects an input loss. 10G: -18dBm or less 2.5G:-32dBm or less (Option.01)

	Item	Specification
	Electric section	
1.23	Alarm measurement	LOS
1.24	Alarm detection condition	LOS Detection: Optical input loss Release: 2 frames
1.25	Same sign tolerance	9 bytes or more
	Input Optical Power measurement	
1.27	Measurement range	10G : -16～-2dBm
1.28	Measurement accuracy	2.5G : -30～-8dBm
2.	Jitter tolerance	



Bit rate	A1 Ulpp	A2 Ulpp	A3 Ulpp	f6 Hz	f7 Hz	f1 Hz	f2 Hz	f3 Hz	f4 Hz
9953.28	0	2	2000	10	12.1	20k	400k	4M	80M
2488.32	0	2	800	10	12.1	5k	100k	1M	20M

	Item	Specification
3.	Mechanical performance	
3.1	Dimensions/mass	22(H)×126(W)×254(D), 2.0 kg or less
4.	Environmental performance	
4.1	Operation temperature	0～+40℃
4.2	Storage temperature	-20～+70℃

Appendix B Options

The table below shows the optional items that are available for MP1570A. These items other than optical connectors must be installed at our plant.

Model or Order No.	Item	Remarks
MP0128A-01	1550 nm band LD module with built-in EA modulator	Option 01
MP0129A-01	1550 nm band LD module with built-in EA modulator	Option 01
MP0130A-01	RMS meas	Option 01 2448M RMS measurement

Model or Order No.	Item	Remarks
MP0127A-38	Replaceable ST optical connector	Option 38 2 pairs for MP0127A
MP0127A-39	Replaceable DIN optical connector	Option 39 2 pairs for MP0127A
MP0127A-40	Replaceable SC optical connector	Option 40 2 pairs for MP0127A
MP0127A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MP0127A
MU150008A-38	Replaceable ST optical connector	Option 38 2 pairs for MU150008A
MU150008A-39	Replaceable DIN optical connector	Option 39 2 pairs for MU150008A
MU150008A-40	Replaceable SC optical connector	Option 40 2 pairs for MU150008A
MU150008A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MU150008A
MP0128A-38	Replaceable ST optical connector	Option 38 2 pairs for MP0128A
MP0128A-39	Replaceable DIN optical connector	Option 39 2 pairs for MP0128A
MP0128A-40	Replaceable SC optical connector	Option 40 2 pairs for MP0128A
MP0128A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MP0128A
MU150009A-38	Replaceable ST optical connector	Option 38 2 pairs for MU150009A
MU150009A-39	Replaceable DIN optical connector	Option 39 2 pairs for MU150009A
MU150009A-40	Replaceable SC optical connector	Option 40 2 pairs for MU150009A
MU150009A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MU150009A

Model or Order No.	Item	Remarks
MP0129A-38	Replaceable ST optical connector	Option 38 2 pairs for MP0129A
MP0129A-39	Replaceable DIN optical connector	Option 39 2 pairs for MP0129A
MP0129A-40	Replaceable SC optical connector	Option 40 2 pairs for MP0129A
MP0129A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MP0129A
MU150010A-38	Replaceable ST optical connector	Option 38 2 pairs for MU150010A
MU150010A-39	Replaceable DIN optical connector	Option 39 2 pairs for MU150010A
MU150010A-40	Replaceable SC optical connector	Option 40 2 pairs for MU150010A
MU150010A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MU150010A
MU150001A-38	Replaceable ST optical connector	Option 38 2 pairs for MU150001A
MU150001A-39	Replaceable DIN optical connector	Option 39 2 pairs for MU150001A
MU150001A-40	Replaceable SC optical connector	Option 40 2 pairs for MU150001A
MU150001A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MU150001A
MU150002A-38	Replaceable ST optical connector	Option 38 2 pairs for MU150002A
MU150002A-39	Replaceable DIN optical connector	Option 39 2 pairs for MU150002A
MU150002A-40	Replaceable SC optical connector	Option 40 2 pairs for MU150002A
MU150002A-43	Replaceable HMS-10/A optical connector	Option 43 2 pairs for MU150002A

Appendix C Self Test Error Codes

See 'Appendix G Self Test Error Codes' of 'MP1570A Operation manual Vol.1 Basic Operation' for the details.

Appendix D 2.5G and 10G Alarm Detection/Release Conditions

See 'Appendix E Alarm Detection and Removal Conditions' of 'MP1570A Operation manual Vol.1 Basic Operation' for the details.

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MA35851